U.S. GOVERNMENT

RESEARCH & DEVELOPMENT REPORTS

May 20, 1965

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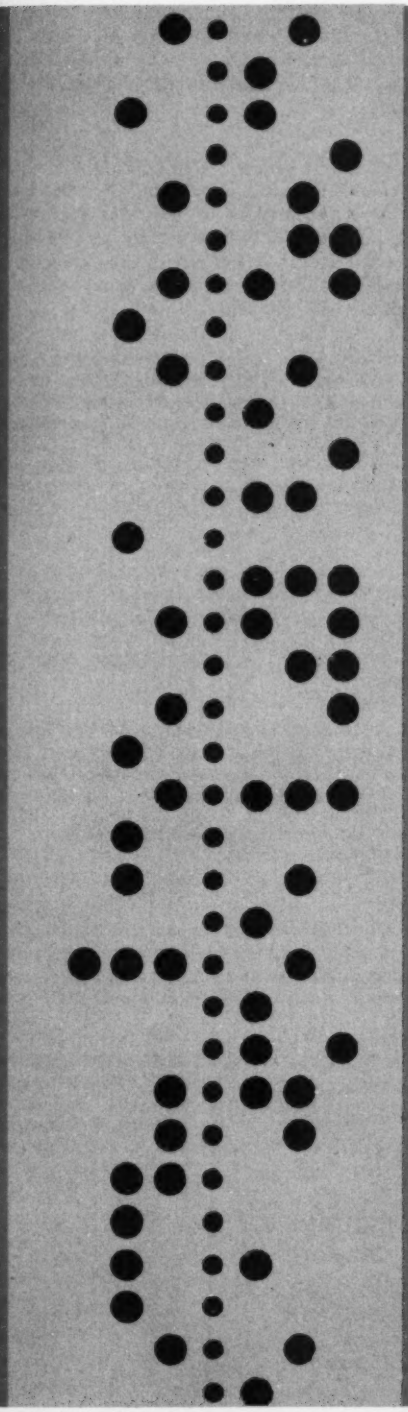

A Semi-monthly Abstract Journal for Science and Industry

CLEARINGHOUSE
FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION

An agency of the U.S. Department of Commerce

May 20, 1965 / Volume 40, Number 10

U.S. Government

RESEARCH AND DEVELOPMENT REPORTS

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PURPOSE

U.S. GOVERNMENT RESEARCH AND DEVELOPMENT REPORTS (formerly U.S. Government Research Reports) is published by the Clearinghouse for Federal Scientific and Technical Information to announce the availability to the public of new reports of U.S. Government-sponsored research and development released by the Department of Defense and other Federal agencies. The Atomic Energy Commission and the National Aeronautics and Space Administration issue their own announcement journals as noted below.

FORMAT

USGRDR contains two sections with a combined table of contents. The first section, "Technical Abstract Bulletin" (TAB), announces reports released by the Defense Documentation Center (DDC) of the Department of Defense. The second section, "Other Research Reports and Related Material," announces reports released by civilian agencies and also includes certain older military reports. Reports are listed by accession/report number under 33 subject division headings. Both sections contain abstracts and complete bibliographic citations and are followed by their respective indexes. Reports of current high industrial interest are featured in **"Research Highlights."**

HOW TO USE

Readers are urged to review all abstracts in their fields of interest, noting accession/report numbers and titles of reports to be ordered. Although primarily for retrieval, the descriptors provide a quick grasp of a report's scope. The reader is reminded that reports applicable to his field may be found under various subject divisions; the various indexes will aid in locating those reports. Cumulative indexes are published periodically.

TO ORDER REPORTS

Order reports by accession/report number (as given on the first line of each entry) and title from the Clearinghouse, U.S. Department of Commerce, Springfield, Va. 22151, or from any Commerce Field Office (listed on inside back cover). Prices for hard copy (HC) and microfiche copy (MF) are given for each entry. Prepayment is required unless purchases are to be charged to Superintendent of Documents deposit account. Order forms will be found in the back. Make check or money order payable to National Bureau of Standards—CFSTI.

OTHER JOURNALS

Reports of the National Aeronautics and Space Administration and the Atomic Energy Commission can be ordered from the Clearinghouse. Reports available are listed in the following journals open to public subscription from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

NUCLEAR SCIENCE ABSTRACTS, Atomic Energy Commission, $30 a year domestic, $37 foreign, $1.75 single copy plus 25 percent foreign mailing.

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS. National Aeronautics and Space Administration, $25 a year domestic, $31 foreign, $1.50 single copy plus 25 cents foreign mailing.

U.S. DEPARTMENT OF COMMERCE
John T. Connor, Secretary

CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION
Springfield, Va. 22151
Bernard M. Fry, Director

Contents may be printed freely. Mention of source will be appreciated. Use of funds for this publication approved by the Director of the Bureau of Budget, June 30, 1961.

RESEARCH highlights

Reports of current high industrial interest

Categories

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Coatings

PRIMER FOR PRESERVING WOOD ON VEHICLES

Through use of a new experimental olive drab oil-alkyd wood primer plus certain commercial topcoats, a substantial improvement can be achieved in outdoor stability of truck floorboards and siding, Army researchers report. The preservative treatment specifically reduces bleeding and blistering. The wood primer has excellent flexibility, adhesion, prolonged outdoor durability, and sufficiently rapid drying for practical industrial use. Order from the Clearinghouse AD-609 663, HC $1.25/MF 50 cents; PRESERVATIVE TREATMENT OF WOOD FOR COMBAT VEHICLES.

Control Systems and Instrumentation

LOW-TEMPERATURE THERMOCOUPLES

Gold-iron thermocouples developed at Ames Laboratory for AEC can quickly, easily, and reliably determine temperatures to an accuracy of 0.05°K in the range from 4.2 to 20°K. Au-Fe wire is drawn to a 0.006 inch diameter, annealed at 550°C for 12 hours in a reducing atmosphere, and then insulated with heavy formvar. Copper is used as the second wire of the thermocouple because of the high purities available. When thermal conductivity must be low, silver is more appropriate. Order from the Clearinghouse IS-1046, HC $1.00/ MF 50 cents; Au-Fe vs Cu THERMOCOUPLES.

Electronics

MICROELEMENT INDUCTORS PRODUCTION

Production of a complete range of micromodule inductors for various equipment requirements has been realized by repackaging existing miniature designs and the designing of new devices, says RCA in a study made for the Army. One of the basic design restraints placed on the inductors has been the minimization of external magnetic fields. This was because of the close proximity of inductive elements that would be encountered in a micromodule or between adjacent micromodules. RCA overcame this problem by using toroidal construction and ferrite technology. Order from the Clearinghouse AD-610 628, HC $7.00/ MF $1.75; MICROELEMENT INDUCTORS, TASK 30, MICROMODULE PROGRAM EXTENSION II.

Engineering and Construction

SYMPOSIUM ON SOIL-STRUCTURE INTERACTION

Behavior of buried structures comprises the bulk of the papers given at a recent soil-structure interaction symposium conducted jointly by the Office of Civil Defense and the University of Arizona. Among other things, the papers discuss the behavior of buried cylinders, conduits, and silos as well as wave propagation around embedded structural elements. Stress-wave propagation in the soil, dynamic behavior of granular media, effects of gage density and placement on measurement of acceleration in the soil, and stress and strain measurement were topics also covered. Order from the Clearinghouse AD-610 549, HC $9.50/MF $3.00; PROCEEDINGS OF THE SYMPOSIUM ON SOIL-STRUCTURE INTERACTION.

Fuels

STORAGE STABILITY OF HIGH TEMPERATURE FUELS

Radiotracers can be used to determine the causes of thermal instability as well as to predict the thermal stability of high temperature fuels during storage, according to the Bureau of Mines. Modification of the 5-ml bomb test equipment and method developed by Phillips Petroleum shows promise of permitting precise measurement of labeled fuel components that contribute to deposits during thermal stressing. The liquid-solid chromatographic method for sample separation lacks the resolving power necessary for good definition of reaction rates of gum formed in high temperature fuels. Although tritium is unsuitable as a radiotracer for use under severe test conditions (such as establishing threshold failure temperature), tritium-labeled compounds can be used for screening reactive components in fuels stored at 110-130°F. Order from the Clearinghouse AD-612 468, HC $3.00/MF 75 cents; STORAGE STABILITY OF HIGH TEMPERATURE FUELS.

Plastics

OUTDOOR EXPOSURE OF PLASTICS

New stress-strain diagrams show the tensile properties of 32 plastics after 3 years of outdoor exposure in temperate, arctic, and tropical climates. Developed by Army researchers, the diagrams show that the rigid PVC's, the ABS polymers, and the epoxy-glass laminates are practically unaffected by weathering. Black polyethylene is unchanged except for a slight increase in stiffness. But polyethylenes without carbon black embrittle rapidly. Polypropylene slightly decreases in modulus and yield strength with outdoor exposure, particularly in the tropics. Modified polystyrenes show little change except for the white extrusion grade which embrittles in each exposure. The latter is likewise true of methyl styrene, copolymers, glass-filled polystyrene, and polycarbonate. Black acetal is embrittled by temperate and arctic zone exposure, but is unaffected in the tropics. Both black and natural nylons decrease in modulus and strength, particularly in temperate climates. Carbon black does not stabilize this material. Order from the Clearinghouse AD-609 405, HC $2.00/MF 50 cents; RESISTANCE OF PLASTICS TO OUTDOOR EXPOSURE.

Power Source Devices

LEAD DIOXIDE AFFECTS EFFICIENCY OF BATTERIES

Major differences in successful and failing storage battery cells are due to a startling contrast in the morphology of particles of lead dioxide in the plates. According to Navy researchers, battery plates containing mostly nondescript pebble-like PbO_2 particles soften and fail, whereas plates made of particles having the form of prismatic needles with many branches, possibly twinned, maintain capacity and firm texture. Battery plates of both lead antimony and lead calcium cells have been examined by electron microscopy, and a considerable difference was found in their particle morphology. Order from the Clearinghouse AD-609 986, HC $1.00/MF 50 cents; MORPHOLOGY OF PbO_2 IN THE POSITIVE PLATES OF LEAD ACID CELLS.

Safety Engineering

FEDERAL FIRE LOSSES CONTINUE TO INCREASE

Fire losses sustained by Federal agencies are in a continuing upward spiral, and the trend probably will continue upward in future years, the Federal Fire Council reports. More than 26,700 fires were reported to the Council by agencies in fiscal year 1963, a decline from 1962, but dollar losses were about $288,000,000--more than double those of 1962 and earlier years. Like dollar losses, deaths and injuries due to fires are rising--to 320 dead and 1,753 injured in 1963. The Council, an interagency advisory group, points out that in the past, fires involved ordinary buildings of common materials and a conventional design as well as normal fuels, routine type occupancies, and simple industrial processes with a minimum complexity of overall fire problems. But the Federal Government, as is the case with industry in general, is now faced with large complex structures, inadequately tested materials, unproven designs, exotic fuels, composite occupancies, complex industrial processes, and a wide range of new fire characteristics. Predominant causes of fires are individual error or carelessness and management failures such as inadequate planning, depreciated structures and equipment, inadequate maintenance, and improper operation or use. Order from the Clearinghouse AD-609 018, HC $2.00/MF 50 cents; FEDERAL FIRE EXPERIENCE FOR FISCAL YEAR 1963.

Transportation (Land, Sea, Air, Space)

DEVICE FOR DETERMINING ACCELERATION OF VEHICLES

A device developed for the Army determines the acceleration of vehicles. Developers at Mississippi State University say it is extremely useful for both aircraft and automotive testing. It can be used remotely for determining take-off distances, propeller thrust measurements, time to certain velocities, and the acceleration of vehicles. Results obtained are both repeatable and reliable. The device has little drag and is reusable. It consists of a timing and recording mechanism attached to a cord which is unreeled from a rotating drum as the vehicle moves. It displays a chart of the vehicle's linear displacement as a function of time. Order from the Clearinghouse AD-609 972, HC $2.00/ MF 50 cents; A DEVICE FOR REMOTELY DETERMINING THE INITIAL ACCELERATION OF VEHICLES.

Wood and Paper

WIDE INDUSTRIAL USES FOR IRRADIATED PLASTIC WOOD

At least six major markets representing a $1-2 billion industry can find highly profitable uses for irradiated plastic-impregnated wood materials, according to an Arthur D. Little Inc. survey. Developed under Atomic Energy Commission sponsorship, the gamma irradiated woods are superior to unmodified types in that they are harder and have greater compression, shear, and static bending strengths. The survey indicates that the irradiated woods are well-suited for application in markets annually consuming about 5 billion board feet of lumber. They can be used in the construction field and in the manufacture of furniture, sporting goods, toys, specialties, and a variety of industrial components. These include such things as specialty flooring: parquets, bowling alleys, and gymnasium flooring are examples. They can be used for commercial and institutional seating, fabricated units for construction, such as window sashes, exterior doors, stairs, and counter tops. They are well-suited for furniture, desk tops, veneers, and cabinets, plus sporting goods, including boat components, golf club heads, and gunstocks. The material is tough--toy manufacturers can use it; specialty items such as cutlery handles and salad bowls can be made of it. Order from the Clearinghouse TID-21434, HC only, $1.00; TECHNICAL AND ECONOMIC CONSIDERATIONS FOR AN IRRADIATED WOOD-PLASTIC MATERIAL.

The abundance of R&D reports available creates a problem for industry in extracting those most likely to prove of value--for technical solutions and in keeping up with new developments. These Clearinghouse tools and services, and others planned, are designed to narrow the search.

PINPOINTING R&D REPORTS

Selection Aids For Industry

▶ GOVERNMENT-WIDE INDEX appearing monthly is a single reference guide to Government-sponsored research and development announced in four of the major technical announcement journals of the Federal Government: USGRDR, Technical Abstract Bulletin of the Defense Documentation Center, Nuclear Science Abstracts of the Atomic Energy Commission, and Scientific and Technical Aerospace Reports of the National Aeronautics and Space Administration. (Annual Subscription $10, $2.50 additional for foreign mailing, $1.25 single copy.) Available from Superintendent of Documents, U.S. Government Printing Office, Washington, D. C., 20402.

▶ SELECTIVE BIBLIOGRAPHIES--from Abrasives to Zirconium--will be mailed free. A list of more than 200 available from the Clearinghouse will be mailed on request. Here is a sample list of ten:

SB-441 Materials Testing
SB-444 Electronic Miniaturization
SB-480 Textile Fibers
SB-515 Paper
SB-518 Paints and Varnishes
SB-523 Batteries
SB-524 Expanded Plastics
SB-526 Metal Composites
SB-529 Hydrofoil Boats
SB-541 Fluid Amplifiers

▶ LITERATURE SEARCHING SERVICE provides two kinds of bibliographies:

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▶ FAST ANNOUNCEMENT SERVICE reviews reports of special industrial significance. Announcements are classified and mailed by industrial category. No charge.

▶ RESEARCH REVIEWS at 50 cents a copy are packaged summaries, abstracts and bibliographies gathered under the following titles (other titles are in progress):

OTR-101 Hot Machining
OTR-102 Nickel-Titanium Alloys
OTR-103 Photochromism and Phototropism
OTR-104 Fire Extinguishing Material Technology
OTR-105 Flame-Retardant Textiles
OTR-106 Humidity Controlled Warehousing
OTR-107 Concrete Technology
OTR-108 Volatile Corrosion Inhibitors
OTR-109 Grease Lubrication
OTR-110 Thermoelectric Materials and Fabrication
OTR-111 Integrated Circuitry
OTR-112 Fluid Amplification

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TECHNICAL ABSTRACT BULLETIN

1. Aircraft and Flight Equipment

AD-613 164 Div. 1
CFSTI Prices: HC$3.00 MF$0.50

Frankford Arsenal, Philadelphia, Pa. Research and Development Directorate.
DEVELOPMENT OF GENERATOR, PROPELLANT ACTUATED, XM14.
Technical research rept.,
by Ludwig Stiefel, George P. Catrambone, and Raymond C. Sutter. Feb 65, 51p Rept. no. R-1751
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
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Descriptors: (*Jettisonable cockpits, Gas generating systems), (*Gas generating systems, Design), Propellants, Burning rate, Cartridges (PAD), Pneumatic systems, Safety valves, Ballistics, Hydrostatics, Stresses, Vibration, Performance (Engineering), Drop testing, Specifications.

A dual gas generator was developed to provide a source of pneumatic power for operating the pre-ejection system for the B58 escape capsule. The gas produced operates a series of leg-positioning and torso-retracting mechanisms and ultimately releases and closes the capsule doors. A high temperature-resistant propellant and igniter were used to meet extended storage and operating requirements at 200F. The dual generator permits use of one charge to enclose the crew member in an emergency. If the emergency passes without ejection, the second generator can be fired to operate the system should this become necessary. A special shift valve arrangement, integral trap, and rupture assembly make for a high degree of reliability and safety. The results of evaluation tests showed the dual gas generator (XM14) capable of meeting the design requirements. (Author)

AD-613 203 Div. 1, 15
CFSTI Prices: HC$2.00 MF$0.50

Litton Systems, Inc., St. Paul, Minn. Applied Science Div.
DETERMINATION OF THE SHAPE OF A FREE BALLOON: CYLINDER, CYLINDER-END, TAPER-TANGENT, AND TANGENT-HARNESS BALLONS,
by Justin H. Smalley. 1 Nov 64, 48p
Scientific rept. no. SR-4; 2671
Contract AF19 628 2783, Proj. 6665, Task 666501
AFCRL 65-68
Unclassified report

Descriptors: (*Balloons, Geometric forms), Mathematical analysis, Stresses, Differential equations, Surface area, Volume, Weight, Cylindrical bodies, Spheres.

Modifications of the basic balloon-shape equations are developed for cylinder and cylinder-end balloons, taper-tangent balloons, and tangent-harness balloons. Examples of the shape of these balloons are presented, and corresponding meridional stresses are determined. Zero and non-zero circumferential stresses are considered. (Author)

AD-613 274 Div. 1, 30
CFSTI Prices: HC$3.00 MF$0.75

Hughes Aircraft Co., Culver City, Calif.
JANAIR: JOINT ARMY-NAVY AIRCRAFT INSTRUMENTATION RESEARCH. ANALYSIS OF PICTORIAL DISPLAYS.
Quarterly progress rept. no. 3,
by W. L. Carel. Mar 65, 73p Rept. no. 2732.01/25
Contract Nonr446800
Unclassified report

See also AD-609 762.

Descriptors: (*Flight instruments, Display systems), (*Display systems, Flight instruments), (*Instrument panels, Display systems), Mission profiles, Pilots, Human engineering, Navigation, Target recognition, Military tactics, Television display systems.

Two topics are discussed: (1) Pictorial display potential, and (2) display requirements. The greatest potential use for aircraft pictorial displays lies in their use for those crew tasks that demand the observation of the relations between a great many inherently related variables. The following tasks are discussed: Observation of aircraft performance, navigation, target recognition, and tactics.

AD-613 300 Div. 1
CFSTI Prices: HC$3.00 MF$0.75

Boeing Co., Renton, Wash. Airplane Div.
THEORETICAL DETERMINATION OF CRASH LOADS FOR A LOCKHEED 1649 AIRCRAFT IN A CRASH TEST PROGRAM.
Technical rept.,
by James P. Bigham, Jr. and William W. Bingham.
Jul 64, 64p
Contract FA64WA5021, Proj. 312 001 01H
FAA-ADS 15
Unclassified report

Descriptors: (*Aviation accidents, Loading (Mechanics)), (*Fuselages, Impact shock), Acceleration, Airframes, Aircraft cabins, Failure (Mechanics), Deflection, Flexible structures, Commerical planes, Transport planes, Equations, Gravity.

Acceleration time histories in directions normal and parallel to the fuselage cabin floor are given at three positions along the length of the fuselage for impact velocities of 140, 160, 180, and 200 feet per second. It is concluded that during the initial impact at 180 feet per second, peak normal accelerations of 11, 0, and -3 times that of gravity (G's) will be developed 0.03 seconds after impact at Body Stations 180, 682, and 1176. Maximum normal and longitudinal accelerations during the 6 degree ramp crash will occur at 0.24 seconds. Maximum normal accelerations at Body Stations 180, 682, and 1176 will be -17, 8, and 35 G's respectively. Maximum longitudinal accelerations will be 4 G's. It is

further concluded that the nose of the airplane will bend upwards 10 inches relative to the center section of the fuselage 0.14 seconds after impact. This deflection will probably be of sufficient magnitude to exceed the ultimate strength of the fuselage above the cabin floor. (Author)

AD-613 313 Div. 1, 28
CFSTI Prices: HC$4.00 MF$1.00

Martin Co., Baltimore, Md.
DISPLAY-CONTROL RELATIONSHIPS IN A SIMULATED SIMULTANEOUS AIRCRAFT-MISSILE CONTROL TASK,
by Marshall A. Narva. Aug 59, 146p
Engineering rept. no. ER-10850
Contract AF33 616 5472, Proj. 6190
Unclassified report

Subcontracted to Institute of Applied Psychology, Univ. of Maryland, College Park.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Flight control systems, Human engineering), (*Aircraft fire control systems, Human engineering), (*Human engineering, Flight control systems), Flight simulators, Display systems, Pilots, Psychomotor tests, Weapon systems.

The purpose of this study may be summarized as being twofold: (1) The obtaining of information concerning the optimal plane of movement and control sensing for an auxiliary missile stick control to be used simultaneously with the primary flight control, (2) The obtaining of information concerning performance as a function of the degree of correspondence of control and environmental variables to specific pilot pre-experimental flight experience. The results indicate that the pilot subjects did not transfer their specific experience with the characteristics of the flight control to the use of the experimental control. The extrapolation of the results to specific design recommendations for controls to be used for ancillary in-flight control tasks must be done with caution due to the relatively low order of simulation of the in-flight control situation. However, the results indicate that such a control should move in the vertical plane and use an up-for-up, right-for-right control sensing.

AD-613 338 Div. 1, 19

Douglas Aircraft Co., Inc., Long Beach, Calif. Aircraft Div.
JANAIR: JOINT ARMY-NAVY AIRCRAFT INSTRUMENTATION RESEARCH, INVESTIGATION OF AUDITORY DISPLAYS.
Final technical rept.,
by Paul E. Abbott and James R. Woodbury.
Jan 65, 133p Rept. no. LB-32125
Contract Nonr433500, Proj. RF012 04 01
Unclassified report

Available only for reference use at DDC Field Services. Copy is not available for public sale.

Descriptors: (*Display systems, Acoustic equipment), (*Landing aids, Display systems), (*Carrier landings, Instrumentation), Flight instruments, Control systems, Auditory signals, Psychoacoustics, Coding, Noise, Guidance, Feasibility studies, Simulation, Control sticks.

A feasibility study was performed to examine the use of acoustic displays in aircraft longitudinal control. Emphasis was given to carrier landing. Initial experiments examined control compatibility of certain acoustic codes, together with their information carrying capability in representative noise. Frequency level and modulation characteristics were explored, together with compensatory and 'pursuit' characteristics. Specific codes were compared, in a major carrier landing simulation, against conventional visual display techniques. Display quickening was introduced and evaluated. A pulse-frequency modulated code at low relative signal level and high relative frequency characteristics, was developed and tested during simulation for speed-angle-of-attack through stick and throttle manipulation, were examined. Dual channel acoustic presentation combining speed-angle-of-attack and height display were explored to a limited extent. Favorable conclusions were made concerning acoustic longitudinal control display. (Author)

AD-613 339 Div. 1
CFSTI Prices: HC$5.00 MF$1.25

Hughes Tool Co., Culver City, Calif. Aircraft Div.
ENGINE AND WHIRL TESTS, XV-9A HOT CYCLE RESEARCH AIRCRAFT.
Summary rept.,
by Carl W. Pieper. Feb 65, 195p
Rept. no. HTC-AD-64-23 (385-T-15)
Contract DA44 177AMC877T, Task 1D121401 A14403
TRECOM TR-64-67
Unclassified report

Descriptors: (*Aircraft engines, Tests), (*Helicopter rotors, Tests), Jet engine valves, Lubrication, Exhaust nozzles, Exhaust pipes, Gas generator engines, Test methods, Instrumentation, Data, Performance (Engineering).

A summary of engine and whirl testing of the rotor and power module portion of the XV-9A is presented. The results of engine testing include operation of two gas generators into a common exhaust duct with transient power conditions. Rotor whirl test results of the hot cycle rotor used on the XV-9A are reported and include functional check-out, performance evaluation and structural evaluation. Results of testing of a jet-reaction yaw control valve are included. (Author)

AD-613 347 Div. 1, 14
CFSTI Prices: HC$3.00 MF$0.75

National Labs. for Research and Testing, Inc., Pawtucket, R. I.
INVESTIGATION OF SEAT BELT WEBBING SERVICE LIFE.
Final rept.,
by Carl H. Stetson, Jr., W. George Parks, Roger Genest, and Frank Katz. Sep 64, 81p
Contract FAA BRD408, Proj. 312 003 01V
FAA-ADS 22
Unclassified report

Descriptors: (*Safety harness, Aircraft seats), Cotton textiles, Fibers (Synthetic), Physical properties, Life expectancy, Tests, Aviation safety.

Various models of belts of different ages were collected in two climatic zones in the United States and subjected to a uniform testing procedure. The outstanding features resulting from the field work included the revelation that the sample pattern as originally planned could not be fulfilled, and the confirmation of a marked lack of interest in seat belts by plane owners and servicing people at airports. A large quantity of belts over ten years old (pre TSO) were found still in use. The laboratory tests showed that of 399 seat belt samples tested, 42 percent failed to meet the minimum strength requirements of Technical Standard TSO c22. Cotton webbing belts showed

a higher incidence of failure than belts made with synthetic fiber webbing. Laboratory tests showed more assembly failures than webbing failures. The performance of all cotton belts tested leads to the conclusion that cotton webbing should not be used in aircraft safety belts. It is recommended that the minimum strength requirements for both webbing and assemblie be raised. Improved administrative procedures for the enforcement of minimum aircraft safety belt standards are also recommended.

AD-613 461 Div. 1
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PROBLEMS OF RESCUING CREWS AT EMERGENCIES AT GREATER SPEEDS AND HIGH FLIGHT ALTITUDES, by A. V. Chesalov. 1 Apr 65, 19p
FTD-TT-65-260
TT 65-61952

Unclassified report

Unedited rough draft trans. of Tekhnika Vozdushnogo Flota (USSR) 1946 [v. 20] no. 10, p. 7-12.

Descriptors: (*Bailout, Aviation safety), (*Aviation safety, Bailout), (*Abandonment, Aviation safety), High altitude, Supersonic flight, Ejection seats, Parachute descents, Breathing apparatus, Flight crews, Aviation medicine, Human engineering, USSR.

Two trends of investigation are discussed: (1) To reduce overloads affecting the human immediately after catapulting by simultaneous gaining of protective methods for the face, internal organs and skin against the action of high speed airflow; and (2) to assure the possibility of sharply decelerating an aircraft suffering an emergency to indicated speeds of the order of 850-900 km/hr.

AD-613 464 Div. 1, 7
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRIC MACHINES WITH EVAPORATION AND UNIVERSAL COOLING SYSTEMS FOR FLYING MACHINES, by V. A. Vinokurov, F. I. Golgofskii, G. I. Danilov, and V. V. Komov. 1 Apr 65, 11p FTD-TT-65-290
TT 65-61953

Unclassified report

Unedited rough draft trans. of Elektrotekhnika (USSR) 1965 (v. 36) no. 1, p. 5-7.

Descriptors: (*Aircraft equipment, Electric motors), (*Electric motors, Cooling), (*Generators, Cooling), Electrical equipment, Aerodynamic heating, Air cooled, Evaporation, Turbines, USSR.

Elucidated are problems of developing cooling methods in small electric machines (motors), used on flying machines. A new cooling system is proposed. (Author)

AD-613 504 Div. 1
CFSTI Prices: HC$3.00 MF$0.75

Air Force Aerospace Research Pilot School, Edwards AFB, Calif.
PERFORMANCE FLIGHT TEST TECHNIQUES, by O. D. Godwin, F. D. Frazier, and R. E. Durnin. 1964, 68p FTC-TIH-64-2006

Unclassified report

Descriptors: (*Flight testing, Handbooks), (*Pilots, Training), (*Aeronautics, Flight testing), Calibration, Climbing, Level flight, Maneuverability, Take-off, Landings.

A handbook written primarily for test pilots is presented. The content of this handbook is not as technical as that required by the flight test engineer but does present the theoretical basis of each performance flight test on the level the average pilot can understand. The major emphasis of this handbook is placed on the actual flight test techniques for 'tricks of the trade' used in flying each performance test so that the pilot new to the field may benefit by the experience of others. The reader should bear in mind that since this handbook was designed specifically for school use, certain procedures as given for the tests are dictated by school conditions. However, the techniques involved in flying the different tests should be applicable anywhere.

AD-613 523 Div. 1
CFSTI Prices: HC$3.00 MF$0.75

Lear Siegler, Inc., Grand Rapids, Mich. Instrument Div.
STATE OF THE ART FOR V/STOL CONTROL DISPLAY.
Interim rept.
Oct 63, 65p Rept. no. GR-1445
Contract AF33 657 11740, Proj. 6190, Task 619005
RTD TDR63-4167

Unclassified report

Descriptors: (*Vertical take-off planes, Reviews), (*Short take-off planes, Reviews), Display systems, Control systems, Propulsion, Feasibility studies, Aerodynamic characteristics, Simulation, Aircraft engines, Instrumentation, Hovering, Flight testing.

A survey was conducted to establish the 'state-of-the-art' in V/STOL control-display development and application. Visitations were made to fifteen United States firms and government agencies actively engaged in V/STOL development and data correlated with reported European V/STOL development. Most research activity to date has been concerned with propulsion feasibility and aircraft aerodynamic characteristics with little emphasis on control-display sub-systems analysis. Some V/STOL simulation has been conducted, primarily in the areas of altitude control during the hover phase. Areas requiring intensive control-display analysis to fully utilize the unique V/STOL capabilities include: engine instrumentation, low air speed sensing and display, wing stall condition and angle of attack during transition phases, visibility requirements, and terminal guidance requirements. (Author)

AD-613 661 Div. 1, 18, 32, 33
CFSTI Prices: HC$3.00 MF$0.75

Planning Research Corp., Los Angeles, Calif.
AN ECONOMIC STUDY OF SUPERSONIC TRANSPORTS. Summary volume for Jul-Dec 58.
29 May 59, 64p
Contract AF18 600 1801

Unclassified report

Descriptors: (*Economics, Transport planes), (*Transport planes, Supersonic planes), Costs, Commercial planes, Feasibility studies, Logistics, Military requirements, Jet transport planes.

The report provides an unclassified summary of the economic study of supersonic transports. All references to classified or proprietary data in the original report have been removed. The economic study was under-

taken to fulfill three principal objectives: (1) To perform a comparative economic analysis of reciprocating, high speed subsonic turbine and supersonic (as presently conceived in the 1960-1970 time period) transport aircraft both in the military system and in commerical airline operations. (2) To provide a preliminary analysis of the value of speed to the military logistics system. (3) To provide a preliminary forecast as to the potential demand for supersonic transports in the domestic and world-wide commercial markets. In order to perform the comparative economic analysis (objective I), it was necessary to develop a cost methodology for estimating direct and indirect operating costs of reciprocating, high speed subsonic turbine and supersonic transport aircraft both in the military system and in commercial airline operation. Thus, a fourth objective was accomplished and a military and commercial cost estimating methodology was provided to assist in evaluating transport aircraft. (Author)

AD-613 691 Div. 1, 2
CFSTI Prices: HC$2.00 MF$0.50

Air Force Cambridge Research Labs., Bedford, Mass.
AN INVESTIGATION INTO THE USE OF TEMPERATURE GRADIENTS AS AN IN-FLIGHT WARNING OF IMPENDING CLEAR-AIR TURBULENCE.
Scientific rept.,
by George McLean. Feb 65, 30p
Environmental research paper no. ERP-85, AFCRL-65-117
Proj. 6020, Task 6020 04 Unclassified report

Descriptors: (*Atmospheric temperature, Turbulence), (*Turbulence, Aviation safety), (*All-weather aviation, Turbulence), (*Weather forecasting, All-weather aviation), Jet streams (Meteorology), Flight paths, Buffeting, Atmospheric sounding, Aircraft, Temperature sensitive elements, Air mass analysis, Experimental data, Tables.

This paper discusses a study that was undertaken to investigate the technique of using in-flight temperature gradients to forecast impending clear-air turbulence (CAT) and some recent studies concerning the relationship between jet stream winds and turbulence. Results of the study indicate that a horizontal temperature gradient observed in flight by direct sensing methods is not a conclusive indicator of impending turbulence. However, an improved inflight indicator of CAT is needed. If winds obtained from rawinsondes were to be computed at 2000-ft intervals (or less) at the time of the original reduction of data by operational units, the maximum values of av. wind speed (change of wind direction/change of height) could easily be computed, coded, and transmitted as part of the standard upper-air code transmission in the same way as other special parameters. If the value of av. wind speed (change of wind direction/change of height) over 2000-ft layers could be computed as described by Kronebach (J. Appl. Meteorology 3:119-125 (1964) and included in the parameters analyzed by the National Meteorological Center, Suitland, Maryland, the writers feel that a substantial improvement could be made to CAT forecasts using rawinsonde data.

2. Astronomy, Geophysics and Geography

AD-613 168 Div. 2, 30
CFSTI Prices: HC$3.00 MF$0.75

Army Electronics Command, Fort Monmouth, N. J.
AREA PRECIPITATION MEASURING INDICATOR,
by William G. Stone. Oct 64, 53p
Technical rept. ECOM-2522
Proj. 1V0 25001A126, Task 1V0 25001A126 02
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Weather forecasting, Data processing systems), (*Data processing systems, Weather forecasting), (*Meteorological parameters, Data processing systems), Meteorological radar, Radar reflections, Digital computers, Television display systems, Performance (Engineering).

This is a detailed discussion of the design, development, and construction, and an evaluation of an experimental model of the Area Precipitation Measuring Indicator (APMI). This system was designed to accept video signals reflected from weather clouds through the use of Radar Sets AN/MPS-34 or AN/CPS-9; to quantize these signals into three measurements: intensity, range extent, and azimuthal extent; and to print these measurement data in alpha-numerical form on a direct-view storage tube. The APMI equipment operates in one of two basic modes: PPI and OFF CENTER. In the OFF CENTER mode, expansion of a target is permitted and a blown-up area is printed on the display. A general description of the overall operation and capability is presented, followed by a detailed description of the theory of operation of the system. Finally, results of the electrical test performed, future system consideration, and conclusions are presented. (Author)

AD-613 176 Div. 2, 32

National Academy of Sciences-National Research Council, Washington, D. C.
THE COMPETITIVE POSITION OF THE PORT OF DURBAN,
by N. Manfred Shaffer. 1965, 273p FFRP-20
Contract Nonr230009, Proj. NR389 105
Unclassified report

Rept. on Foreign Field Research Program
Northwestern Univ., Studies in Geography, no. 8.
Available from Northwestern University Press, 1840 Sheridan Road, Evanston, Ill. $3.75.

Descriptors: (*Union of South Africa, Harbors), Economics, Commerce, Railroads, Shipping (Marine), Roads, Mozambique.

Contents:
The ports: general background
The ports: some general comparisons
The ports: their development and facilities
Durban and Port Natal
Port Elizabeth in Algoa Bay
East London and Buffalo Harbor
Lourenco Marques in Delagoa Bay
Sordwana Bay on the Zululand Coast
The port linkages: continental and maritime
The port hinterlands: actual and theoretical: traffic hinterlands, commodity hinterlands, primary hinterlands, competitive hinterlands, theoretical hinterlands.

AD-613 199 Div. 2, 8
CFSTI Prices: HC$2.00 MF$0.50

TEMPO, General Electric Co., Santa Barbara, Calif.
APPROXIMATE SERIES SOLUTIONS OF THE THREE-SPECIES ATMOSPHERIC DEIONIZATION DIFFERENTIAL EQUATIONS,
by R. L. Bogusch. 1 Feb 65, 37p Rept. no. RM65TMP7
Contract DA49 146XZ281, Task 07 028
DASA 1597
Unclassified report

Descriptors: (*Atmospheric sounding, Numerical methods and procedures), (*Numerical analysis, Differential equations), (*Ionization, Ionosphere), (*Nuclear explosions, Atmosphere), Electromagnetic waves, Propagation, Interference, Ions, Electrons, Electron density, Nuclear weapons, Explosion effects, Geophysics.

In the course of investigating the effects of a nuclear explosion on electromagnetic wave propagation, it is often convenient to consider the ionized constituents of the atmosphere to be represented by a single species of positive ions, a single negative ion species, and electrons. The number densities of these charged particles at a specific time after detonation are then obtained from the solution of a system of three differential equations which describe the time rate o change of each particle density. An exact analytic solution has not been found for these equations, and hence either approximate analytic forms or numerical integration methods are employed. The latter offers high accuracy but is often too time-consuming for general application. In this report a new set of approximate analytic solutions are derived which provide accuracies approaching that of numerical integration for many cases, but which retain the advantage of rapid computation. (Author)

AD-613 264 Div. 2, 25
CFSTI Prices: HC$5.00 MF$1.00

Defense Research Lab., Univ. of Texas, Austin.
REPORT ON RESEARCH TO INVESTIGATE ATMOSPHERIC INFRASONIC PRESSURE VARIATIONS.
Annual rept. no. 2, 1 Jun 63-31 May 64,
by W. C. Richie. 4 Jan 65, 155p
Acoustical rept. no. DRL-A-237
Contract DA36 039SC90719
Unclassified report

Descriptors: (*Acoustics, Atmosphere), (*Atmosphere, Acoustics), Turbulence, Extremely low frequency, Sound, Propagation, Statistical analysis, Geophysics, Instrumentation.

The pressure variations of the atmosphere at White Sands Missile Range, New Mexico, were recorded using a solion infrasonic microphone array. The dimensions of the square array were 10,000 ft per side. The solion infrasonic microphone monitored data in the pressure range of 0.1 to 500 dyn/sq cm and in the frequency region of 0.033 to 50 cps. Measurements were made during high winds (20 to 30 knots) and very low winds (0 to 4 knots). The statistical nature of the infrasonic atmospheric pressure data obtained is presented by the use of probability density functions, autocorrelation functions, cross-correlation functions, power spectra, and cross-power spectra. These results indicate that the high-wind infrasound was caused by statistically independent eddies. The eddies were created by large scale atmospheric motions associated with the high winds. The power spectra afforded a means by which relative eddy size estimates were calculated for the high-wind infrasound. The statistical properties of the

low-wind data indicate that the low-wind infrasound was probably radiated by upper atmospheric turbulence. (Author)

AD-613 267 Div. 2
CFSTI Prices: HC$1.00 MF$0.50

Norwegian Defence Research Establishment, Oslo.
EXPERIMENTAL STUDIES OF THE ARCTIC D-REGION.
Summary rept. for 1 May 63-30 Sep 64,
by B. Landmark. 10 Dec 64, 21p Intern Rapport E-49
Contract AF61 052 599

Unclassified report

Limited number of copies containing color other than black and white are available until stock is exhausted. Reproductions will be made in black and white only. Copy is available for public sale.

Descriptors: (*Atmospheric sounding, Arctic regions), (*Arctic regions, Atmospheric sounding), (*Ionosphere, Atmospheric sounding), Electron density, Charged particles, Geophysics, Sounding rockets, Payload, Launching, Launching sites, Norway, Probes (Electromagnetic).

This report describes the status of the research programme undertaken in Norway to study the polar D-region. This is concentrated on studies of the high latitude particles and the different effects of these on the ionosphere. A rocket range has been established at Andya in Northern Norway, and the facilities at this range have been gradually built up. A propagation technique has been used successfully in electron density and collision frequency observations by means of rockets. Integrated rocket payloads carrying many related experiments in the same payload have been launched, and extensive ground-based observations undertaken. (Author)

AD-613 278 Div. 2, 30
CFSTI Prices: HC$3.00 MF$0.75

Technology, Inc., Dayton, Ohio.
AIRBORNE MAGNETIC TAPE RECORDER FOR GRAVITY MEASUREMENTS.
Final scientific rept.,
by Cyril G. Peckham and Charles D. Conner. Dec 64, 54p TI-64-121
Contract AF19 628 2755, Proj. 7600, Task 760007
AFCRL 65-61

Unclassified report

Descriptors: (*Gravity, Magnetic recording systems), (*Magnetic recording systems, Gravity), Airborne, Meters, Magnetic tape, Digital systems, Data processing systems, Digital computers, Geophysics, Flight tests, Geodesics.

This report treats of the development of an airborne recorder to transcribe onto magnetic tape in digital form the parameters needed to compute the gravitational field encountered by an aircraft at any point above the earth's surface. The number of bits allocated for the recording of each parameter was conditioned by the resolution required for optimum accuracy as well as by the range of values. To determine the accuracy, researchers investigated the current sensing and recording devices employed and reviewed the previous efforts to extract, process, and evaluate previously acquired data. Through this study which included the applicability of different smoothing techniques and determination of the effects of measurement errors on the Eotvos effect, information to guide the computer processing of the data as well as to define the parameters was developed. Based upon a complete design, a prototype recorder was fabricated. Including provisions for recording all parameters, the prototype recorder incorporates the means to digitize five of the more difficult parameters to process manually. (Author)

AD-613 281 Div. 2, 12
CFSTI Prices: HC$3.00 MF$0.75

Hawaii Inst. of Geophysics, Honolulu.
TIROS OBSERVATIONS OF TYPHOON FORMATION,
by Michio Shiroma and James C. Sadler.
Jan 65, 76p Scientific rept. no. SR-1, HIG-65-3
Contract AF19 628 3860, Proj. 6698, Task 669802
AFCRL 65-24

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Meteorological satellites, Air mass analysis), (*Tropical cyclones, Air mass analysis), (*Air mass analysis, Tropical cyclones), (*Weather forecasting, Meteorological satellites), Photographs, Cloud cover, Vortices, Marine meteorology, Tropical regions.

Data from conventional sources, including aircraft reconnaissance, are utilized in an effort to interpret and determine the utility of meteorological satellite photographs during the important early phases of tropical cyclone development and intensification to typhoon intensity. This study involves three cyclones. Two developed from vortices embedded in the low-level monsoon trough and the third from an initial vortex in the upper-tropospheric trough. The initial vortices are evident in the wind field before becoming recognizable in the TIROS pictures. They become apparent as vortices in the pictures before they reach tropical storm intensity. Recognizable changes occur in the TIROS views as the storms intensify to typhoon intensity. (Author)

AD-613 288 Div. 2
CFSTI Prices: HC$1.00 MF$0.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AN INVESTIGATION OF WHITEOUT DISSIPATION TECHNIQUES.
Final rept.,
by James E. Jiusto and Thomas R. Mee, Jr.
May 64, 25p
Contract DA11 190ENG100, Task 8X99 27 001 03
CRREL TR-148

Unclassified report

Rept. on Proj. Whiteout.
See also AD-414 539.

Descriptors: (*Fog, Countermeasures), (*Artificial precipitation, Fog), Cloud cover, Snow, Visibility, Carbon dioxide, Solidified gases, Pellets, Scattering, Aircraft, Rockets, All-weather aviation, Greenland, Test methods, Meteorology.

Means for modifying whiteouts in arctic regions in support of Army functions were investigated. An experimental program (1960) in Greenland demonstrated that dry ice seeding of supercooled clouds (fog) would facilitate certain operations in whiteouts. Various seeding techniques compatible with the arctic environment were subsequently studied; the techniques involved seeding from aircraft, rockets, tethered blimps and drones. A bench-model pellet maker was constructed for efficient conversion of liquid carbon dioxide to dry-ice pellets of a prescribed size. The relationships among dry-ice pellet size, pellet fall velocity and distance, cloud

temperature, and number of ice crystals produced were established. With this information, favorable seeding patterns and equipment were postulated to fulfill the following objectives: (1) To maintain safe landing corridors at fixed ice cap installations. (2) To provide aircraft with an emergency landing capability over isolated terrain. (3) To facilitate certain ground operations. (Author)

AD-613 293 Div. 2
CFSTI Prices: HC$5.00 MF$1.00

Instrument Corp. of Florida, Melbourne.
GEODETIC PHOTOGRAMMETRIC RESEARCH AND TECHNIQUE DEVELOPMENT.
Final rept.,
by Curtis A. Walker. Nov 63, 173p
Contract AF19 604 5967, Proj. 7600, Task 76003
AFCRL 63-874

Unclassified report

See also PB-143 235.

Descriptors: (*Geodesics, Photogrammetry), (*Photogrammetry, Geodesics), (*Stroboscopes, Beacons), (*Beacons, Stroboscopes), Airborne, Aerial photography, Ballistic cameras, Special purpose cameras, Camera lenses, Azimuth, Determination, Light pulses, Phototheodolites, Photomultipliers, Photoflash lamps, Calibration, Scientific research.

Scientific studies and field exercises lead to an Aircraft operational Stroboscopic Beacon modified to function above 25,000 feet as the Photogrammetric Triangulation System's focal point; an improved azimuth determination technique for resolving Hiran long-line distances to accuracies greater than two seconds of arc; the theory and method of calibrating ballistic camera lenses; the 1000 MM Photogrammetric Camera; a standard, self-contained, mobile photogrammetric triangulation system incorporating power and communications units; a photosensor for detection of light flashes generated by strobe or pyrotechnic devices. Research is also accomplished in the possible use and application of the above devices to aid in attaining the immediate goal of an intercontinental datum tie equal in accuracy to the internal accuracy of datums themselves.

AD-613 298 Div. 2
CFSTI Prices: HC$4.00 MF$0.75

John Carroll Univ., Cleveland, Ohio.
ANALYSIS OF THE RELATIONSHIP BETWEEN ASSOCIATED VOLCANIC AND SEISMIC EVENTS.
Final rept.,
by Edward J. Walter. Oct 64, 112p
Contract AF19 628 218, Projs. 8652, ARPA order 292, Task 865201

Unclassified report

Descriptors: (*Seismology, Volcanoes), (*Volcanoes, Seismology), Earthquakes, Italy, Hawaii, Japan, Geophysics, Data processing systems, Graphics, Computers.

The purpose of the study was to determine whether or not volcanic quakes are the same as ordinary earthquakes, and if not, just how they differ and what seismic parameters can be used to identify them. Three areas were selected for investigation: Italy, Hawaii and Japan. Volcanoes in Italy and Japan are explosive while those in Hawaii are not. Seismic data from all three areas were analyzed. Crustal models and seismic wave velocities, where available, were used as a basis for locating epicenters. Graphical methods such as the delta P-H Arc-Distance Method and the Hyperbolic Method were used to locate epicenters. A computer program was set up for the same purpose. Several techniques were developed to augment the use of data in the computer program. One of these was the technique of supplying a fictitious arrival time at a seismic station and varying this arrival time value until all the input data converged to a solution. Results of the graphical solutions and those from the computer program were in excellent agreement.

AD-613 309 Div. 2
CFSTI Prices: HC$1.00 MF$0.50

General Dynamics/Astronautics, San Diego, Calif.
BASIC HIGH ALTITUDE RESEARCH.
Annual rept. for 1 Oct 63-30 Sep 64,
by M. Griggs. 30 Sep 64, 3p
Contract Nonr239700, Proj. NR211 026

Unclassified report

Descriptors: (*Atmospheric sounding, Meteorological balloons), (*High altitude, Atmospheric sounding), Sky brightness, Spectra (Visible and Ultraviolet), Astronomy, Spectrum analyzers, Geophysics, X rays, Gamma rays.

A balloon flight to measure the sky brightness in the ultraviolet from 113,000 ft was successfully carried out. The experiment was designed to measure the sky brightness as a function of wavelength (2500 - 3700A) and scattering angle. The spectrometer was programmed to make measurements at different elevation angles, and was rotated continuously in azimuth. In addition to this balloon flight, one was done in conjunction with a program in x-ray and gamma ray astronomy.

AD-613 322 Div. 2
CFSTI Prices: HC$1.00 MF$0.50

Air Force Cambridge Research Labs., Bedford, MASS.
SOLAR TEMPERATURE MEASUREMENTS AT 15 AND 35 Gc.
Physical sciences research paper,
by K. N. Wulfsberg and J. A. Short. Feb 65, 16p
PSRP-77, AFCRL 65-75
Proj. 4600, Task 4600 09

Unclassified report

Descriptors: (*Solar radiation, Measurement), (*Sun, Temperature), Atmosphere, Attenuation, Extremely high frequency, K band, Solar eclipses, Radio astronomy, Antennas.

Solar temperatures measured at 15 and 35 Gc over a nine-month period indicate that the temperatures are sufficiently stable with time to warrant using the sun as a source for measuring total atmospheric attenuation at these frequencies. The average disk temperature was 15100K at 15 Gc and 10420K at 35 Gc. All measurements fell within ±5 per cent at 15 Gc and within ±3 per cent at 35 Gc, the variations being due principally to measurement errors. Measurements were also made during the solar eclipse of 20 July 1963. (Author)

AD-613 336 Div. 2, 16, 32
CFSTI Prices: HC$5.00 MF$1.00

California Univ., Los Angeles. Dept. of Geography.
THE INFLUENCE OF CONTEMPORARY MAN ON THE ZOOGEOGRAPHY OF THE PANAMA LAND BRIDGE.

Final rept.,
by Charles F. Bennett. 14 Feb 65, 175p
Contract Nonr23384, Proj. NR389 136
Unclassified report

Descriptors: (*Ecology, Panama), (*Panama, Ecology), (*Geography, Panama), Archaeology, Anthropology, Paleontology, Human, Animals, Plants (Botany), Natural history.

The biophysical geography of the Republic of Panama is summarized. There are detailed discussions of pre-historic and historic human ecology on the isthmus with emphasis given to exploitive activities and how they relate to biotic disturbances and alterations. It is shown that man must have been in the isthmian area nearly 20 thousand years ago and that his activities, first as a food gatherer and later as a food producer and gatherer, have markedly influenced the vegetation cover and the faunal patterns on the isthmus. It is posited that the environmental influence was sufficiently great in pre-historic times to have played a significant role in certain faunal dispersals over the land bridge which connects North and South America. The Spanish invasion in the 16th century resulted in a drastic decrease in human population which led to the reestablishment of forest cover over large parts of the isthmus and, probably, an alteration of some of the faunal patterns which obtained at the time of European contact. The imposition of new land-use patterns and the growth of human populations in recent years have led again to major tree removal and faunal impoverishment.

AD-613 380 Div. 2

Pacific Naval Lab., Esquimault (British Columbia).
MICROPULSATIONS AT NEAR CONJUGATE STATIONS IN THE AURORAL ZONES AND THEIR ASSOCIATION WITH OTHER IONOSPHERIC PHENOMENA,
by Charles Wright. 1964, 33p Reprint no. 64-9
Unclassified report

Pub. in mono. Natural Electromagnetic Phenomena Below 30kc/s 1964 p287-318 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Magnetic storms, Aurorae), (*Aurorae, Magnetic storms), (*Ionospheric disturbances, Magnetic storms), Atmospherics, Geophysics, Arctic regions, Electronic recording systems.

This report deals with the results of the joint operation with Stanford University at Fort Churchill, Great Whale River and its near conjugate at Byrd Station. On the assumption that data recorded at conjugate points will be very similar and will occur nearly simultaneously, attention was focused on the micropulsation and magnetograph 'events' which occur quite frequently and introduce Birkeland's Polar Elementary Storms. These have adequately sudden commencements to enable them to be timed with an accuracy of about 1/2 minute for a single micropulsation event. These events are preceded by a quiet interval and followed by bays, or DP's. It is suggested that the opportunity exists of examining in more detail the relative importance of local mean and geomagnetic time in the incidence of these events in different longitudes around the globe and the difference in form between daytime and night-time events. In the frequency range of 0.005 to 3 cps, with which this report is almost entirely concerned, the balance of evidence is that conjugate points in the auroral zones are of fleeting duration in the sense that points which are conjugate one day are not necessarily conjugate next day or next week. It seems that the origin of the events lies within the magnetosphere, but a direct relation with fluctuations in the solar wind cannot be excluded.

AD-613 389 Div. 2

New York Univ., N. Y. School of Engineering and Science.
ESTIMATES OF THE POWER SPECTRUMS FOR FULLY DEVELOPED SEAS FOR WIND SPEEDS OF 20 TO 40 KNOTS, A PROPOSED SPECTRAL FORM FOR FULLY DEVELOPED WIND SEAS BASED ON THE SIMILARITY THEORY OF S. A. KITAIGORODSKII, THE INTERPRETATION OF WAVE SPECTRUMS IN TERMS OF THE WIND PROFILE INSTEAD OF THE WIND MEASURED AT A CONSTANT HEIGHT.
Revised ed.,
by Lionel Moskowitz and Willard J. Pierson, Jr.
1 Sep 64, 42p
Contract N62306 1042
Unclassified report

Pub. in Journal of Geophysical Research (U. S.) v69 n24 p5161-5203 Dec 15 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of rept. dated 9-16 Apr 64.

Descriptors: (*Ocean waves, Wind), (*Wind, Ocean waves), Seas, Surface properties, Graphics, Oceanology.

Various criteria pertaining to the synoptic situation are presented in order to determine when a fully developed wind-generated sea might be found in the North Atlantic Ocean. Four hundred and sixty wave records, corresponding to various synoptic situations, were digitized and analyzed spectrally as a first step in the preparation of a climatology of ocean wave spectrums. The data for the spectrums of fully developed seas obtained by Moskowitz (1964) for wind speeds from 20 to 40 knots (10.29 to 20.58 m/sec), are used to test the similarity hypothesis and the idea proposed by Kitaigorodskii (1961) that, when plotted in a certain dimensionless way, the power spectrums for all fully developed seas should be of the same shape. The variation of the mean wind with height (as a function of the variously proposed drag coefficients) affects the interpretation of wave spectrums for fully developed seas. It is found that the effect brings the results of Neumann, Wilson, and Moskowitz and Pierson into closer agreement. Further improvement in wave theory will depend on the solution of problems in turbulence and on more precise measurements of waves and winds at sea.

AD-613 421 Div. 2, 8, 30

Cornell Univ., Ithaca, N. Y.
THE CORNELL RADIO POLARIMETER,
by Marshall H. Cohen. 14 Oct 57, 8p
Unclassified report

Pub. in Institute of Electrical and Electronics Engineers. Proceedings (U. S.) v46 n1 p183-90 Jan 1958 (Copies not available to DDC or Clearinghouse customers)
Supported by contracts with ONR, RADC, and NSF grant.

Descriptors: (*Radio equipment, Polariscopes), (*Polariscopes, Radio astronomy), (*Astrophysics, Polariscopes), Solar disturbances, Magneto-optic effect, Polarization, Very high frequency, Astronomical observatories, Universities, New York.

The Cornell polarimeter operates on 201.5 mc with a bandwidth of about 10 kc. This bandwidth is an order of magnitude smaller than previously used. The instrument is basically similar to the interference polarimeter built by Little and Payne-Scott, although it does not operate on an interference basis. The two circular components and the phase and correlation are measured. Ratios of the measured quantities are used graphically

to find the polarization percentage and axial ratio. The system is calibrated on a relative basis by transmitting noise from a distant vertical dipole. The errors introduced by inaccuracies in the antennas are discussed; it is shown that the measured inaccuracies might give errors on the order of ±0.05 in axial ration and polarization fraction. The observed polarizations are similar to what has been reported by other observers, so qualitively there is no gross 'bandwidth effect.' Mixed and variable polarizations have been seen. An example of a mixed polarization record is shown. (Author)

AD-613 423 Div. 2

Cornell Univ., Ithaca, N. Y.
RADIO ASTRONOMY POLARIZATION MEASUREMENTS,
by Marshall H. Cohen. 14 Oct 57, 13p
Unclassified report

Pub. in Institute of Electrical and Electronics Engineers. Proceedings (U. S.) v46 n1 p172-183 Jan 1958 (Copies not available to DDC or Clearinghouse customers).
Supported by contracts with ONR, RADC, and NSF.

Descriptors: (*Radio astronomy, Polarization), (*Polarization, Radio astronomy), (*Astrophysics, Radio astronomy), Magneto-optic effect, Ionosphere, Solar corona, Nebulae, Electron density.

Various polarization measuring schemes are discussed in terms of the Stokes parameters. The methods are separated into three groups according to the number of components isolated by the antenna system. The dispersion resulting from the frequency dependence of the Faraday effect is considered, and the interpretation of polarization data in terms of these effects in discussed. Some results are that one polarization determination will allow limits to be placed on the axial ratio and polarization percentage at the source, and on the ray path integral of longitudinal magnetic field times electron density. A graphical presentation of Hatanaka's dispersion theory permits this to be done very quickly. With suitable assumptions, measurements at two frequencies or with two bandwidths will fix the three quantities. Radio astronomy polarization observations are surveyed. The ionosphere, solar corona, and Crab Nebula are considered briefly in the light of possible Faraday effects. Mayer, McCullough, and Sloanaker's 3.15-cm observations on the Crab Nebula and the optical results are used to analyze lower frequency attempts to find polarized radiation from this object. (Author)

AD-613 465 Div. 2, 25
CFSTI Prices: HC$3.00 MF$0.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
RADIATION PROCESSES IN STRATIFORM CLOUDS (CHAPTER I, SECTION 5 AND CHAPTER II, SECTIONS 1-7),
by E. M. Feigel'son. 19 Mar 65, 93p FTD-MT-65-48 TT 65-61954
Unclassified report

Edited machine trans. of mono. Radiatsionnye Protsessy v Sloistoobraznykh, Moscow, 1964, chap. 1, sect. 5, p. 59-65; chap. 2, sect. 1-7, p. 69-119. Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Clouds, Light transmission), (*Light transmission, Clouds), Solar radiation, Atmosphere, Optical properties, Water vapor, Carbon dioxide, Ozone, Absorption spectrum, Light, Scattering, Optics, USSR.

Contents: Cloudy Atmosphere as an Optical Medium; Scattering and Absorption in a Cloudless Atmosphere; Data on Scattering; Absorption Spectrum of Water Vapor, Carbon Dioxide and Ozone; Approximation of the Spectral Transmission Function of a Cloudless Atmosphere; Scattering of Light in Clouds; Calculation of Fluxes; Light Reflected and Transmitted by Clouds; Determining the Spectrum of Particles by Scattering of Light in a Cloud.

AD-613 494 Div. 2, 20

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
ENERGY SPECTRUM AND STRUCTURE OF LARGE AIR SHOWERS, III-2-5,
by J. Linsley, L. Scarsi, and B. Rossi. 1962, 12p
Unclassified report

Pub. in Physical Society of Japan. Journal v17 supplAIII 1962 (Copies available only to DDC users)
Supported by NSF, AEC, ONR, and AFOSR.

Descriptors: (*Cosmic ray bursts, Particle spectra), (*Astrophysics, Cosmic ray bursts), Nuclear particles, Energy, Radiation measurement systems, Nuclear physics.

The astrophysically interesting features of cosmic radiation investigated are the energy spectrum, the composition, the maximum energy, and the distribution of arrival directions.

AD-613 500 Div. 2, 20

New Mexico Univ., Albuquerque.
ELECTRON-PHOTON ENERGIES IN EXTENSIVE AIR SHOWERS,
by J. R. Green and J. R. Barcus. 25 Sep 61, 16p
Unclassified report

Supported in part by AFOSR and NSF. Pub. in Nuovo Cimento (Italy). Series X v23 p708-23 Feb 16 1962
Copies available only to DDC users.

Descriptors: (*Cosmic ray bursts, Energy), (*Electrons, Cosmic ray bursts), (*Photons, Cosmic ray bursts), Nuclear reactions, Radiation measurement systems, Astrophysics.

Average electron and photon energies are found at various distances from the cores of extensive air showers by comparing the multiplicities produced under different thicknesses of lead and of water absorbers as measured through the use of two large scintillators. For distances from 2.3.10/2 to 1.4.10/1 shower units from the cores of showers of 100,000 to 10 to 7th power particles the total energy carried by electrons and photons per electron is found to be 61(r/r sub 2/0.74 MeV per electron. The ratio of the average photon energy to the average electron energy is found to vary from 1.5 to 3.3 at different distances. Transition curves obtained with different thicknesses of water as absorber are used to show that for showers of 460,000 particles a total of 1.5 times 10 to the 12th power eV is expended in the production of pions per nuclear interaction to give an inelasticity of 0.33. (Author)

AD-613 501 Div. 2, 20

New Mexico Univ., Albuquerque.
FURTHER MEASUREMENTS OF THE SIZE-SPECTRUM

OF EXTENSIVE AIR SHOWERS,
by J. R. Green and J. R. Barcus. 20 May 61, 8p
Unclassified report

Supported in part by AFOSR and NSF.
Pub. in Nuovo Cimento (Italy). Series X v21 p361-8 Jul 16 1961.
Copies available only to DDC users.

Descriptors: (*Cosmic ray bursts, Particle spectra), Nuclear particles, Particle size, Measurement, Scintillation counters, Astrophysics.

Measurements on the size-spectrum of extensive air showers were made over a period of about one year to include approximately 100,000 events. It is found that errors of about 5% in determining the number of particles traversing the scintillator make it impossible to observe time variations of less than 8%. Briefly, the method employed consists in finding the integral spectrum of the pulse-size distribution occurring in a large liquid scintillator.

AD-613 511 Div. 2

Southern Illinois Univ., Carbondale.
CONSTANCY OF HEAVY PRIMARY COSMIC RAYS,
by O. B. Young, T. P. Wang, and P. C. Hsieh.
30 Aug 61, 7p
Unclassified report

Pub. in Nuovo Cimento (Italy) v23 Ser10 p101-7 Jan 1 1962 (Copies available only to DDC users)
Supported by NSF.

Descriptors: (*Cosmic rays, Solar flares), (*Solar flares, Cosmic rays), Neutrons, Terrestrial magnetism, Meteorological balloons, Radiation measurement systems, Colloids.

The results of two experiments are presented. The experiments add substantial evidence to the belief that heavy relativistic primary cosmic rays of charges equal to or greater than ten are not appreciably affected by solar activities. Nor is the total flux at the top of the atmosphere at a given geomagnetic latitude influenced appreciably by intervening magnetic fields between the earth and the sun or by the magnetic field of the earth. Comparison with neutron intensities were made. Ilford G-5 emulsions were exposed during balloon flights at geomagnetic latitudes of 62 degrees N and 41 degrees N. The first experiment was based on a short, high-activity period of the sun. The second experiment covered eight years at times when no large flares existed. (Author)

AD-613 515 Div. 2

Geophysical Sciences Lab., New York Univ., N. Y.
OBSERVATIONS OF THE EQUATORIAL UNDERCURRENT IN THE ATLANTIC OCEAN AT 15 DEGREES W DURING EQUALANT I.
Revised ed.,
by G. Neumann and R. E. Williams. 14 Oct 64, 7p
Contract Nonr28503
Unclassified report

Pub. in Journal of Geophysical Research (U. S.) v70 n2 p297-304 Jan 15 1965 (Copies not available to DDC or Clearinghouse customers)
Revision of rept. dated 24 Aug 64.

Descriptors: (*Ocean currents, Atlantic Ocean), (*Atlantic Ocean, Ocean currents), Oceanographic vessels, Hydrographic surveying, Oceanology.

During the Equalant I program in 1963, the ship Explorer of the U. S. Coast and Geodetic Survey obtained measurements in the region of the Atlantic equatorial undercurrent between 15 degrees W and 14 degrees W. The average speed of the current as derived from drogue tracking at a depth of 50 m during phase I of the operation was 80 cm/sec and during phase II 75 cm/sec. Near the equator, observations of the undercurrent indicate meanders with a meridional amplitude of as much as 3 miles. Temperature and salinity sections across the undercurrent show clearly the spreading of the thermocline and the high-salinity core, respectively, associate with this current. (Author)

AD-613 533 Div. 2, 4, 13
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
FILM STUDIES OF SURFACE ACTIVE MATERIAL COLLECTED IN THE NORTH ATLANTIC.
Interim rept.,
by M. A. Scheiman and N. L. Jarvis. Jun 63, 22p
Memo rept. no. NRL-MR-1440
Task RUDC4B000 652 1F001 99 01
Unclassified report

Descriptors: (*Water pollution, Surface-active substances), (*Sea water, contamination), (*Surface-active substances, Water pollution), Organic materials, Films, Surface properties, Adsorption, Ocean waves, Atlantic Ocean, Aliphatic compounds, Spectra (Infrared), Chromatographic analysis.

Force/area and surface potential/area isotherms of nine samples of organic surface active materials collected from various positions in the North Atlantic were studied on distilled water (acidified to pH 2.0), and synthetic sea water substrates. Each of the six samples collected under approximately the same conditions were similar in surface activity and surface potential. Three samples, collected under different sea conditions or in areas where contamination was likely to occur, varied from this average. (Author)

AD-613 539 Div. 2
CFSTI Prices: HC$3.00 MF$0.75

Dayton Univ., Ohio. Research Inst.
SMALL SCALE WIND SHEARS FROM ROSE BALLOON TRACKED BY AN/FPS 16 RADAR.
Final rept.,
by William E. Brockman. Dec 64, 100p
Contract AF19 604 7450, Proj. 6682, Task 668203
AFCRL 65-99
Unclassified report

Descriptors: (*Wind, Shear stresses), (*Meteorological balloons, Wind), Radar tracking, Polynomials, Mathematical analysis, Data, Theory, Metallic textiles.

The ROSE balloon/AN-FPS-16 radar system is designed to report small-scale winds and shears by polynomial smoothing of the radar tracking data. The most successful mathematical technique for fitting the data and computing winds and shears is presented along with other techniques which were considered but ultimately rejected. Analysis of the self-induced balloon motion is attempted by classical physical methods and by a Power Spectral Density Technique. A criterion for evaluating the effect of modification to the standard ROSE is developed and applied to modified ROSEs and the newer small lightweight balloon. (Author)

AD-613 544 Div. 2, 30
CFSTI Prices: HC$3.00 MF$0.75

Lowell Technological Inst. Research Foundation, Mass.
AN ELECTROOPTICAL SYSTEM FOR THE STUDY OF

CLOUD-TO-GROUND LIGHTNING.
Final rept. for 1 Jun 63-30 Sep 64,
by Richard E. Kenyon. Dec 64, 95p
Contract AF19 628 2972, Proj. 5631, Task 563101
AFCRL 64-1002
Unclassified report

Descriptors: (*Lightning, Recording systems), (*Electronic recording systems, Lightning), (*Photographic recording systems, Lightning), Stereoscopic photography, Photographic equipment, Remote control systems, Electronic equipment, Geophysics, Atmospherics.

This report describes the design, fabrication, test and operation of a system of electro-optical instrumentation for recording by electronic and photographic means, parameters of cloud-to-ground lightning strokes. A complete description is given of the instrumentation, test results and field operations resulting from this program. After field tests in the spring and summer of 1964, the instrumentation was shipped to Kissimmee, Florida and was set up to obtain photographs of lightning. The Florida field experiment was conducted in cooperation with the Air Force Hyperbolic Direction Finding Network which was prepared to record the sferics produced by the lightning strokes being photographed. Due to an unusual period of low incidence of thunderstorm activity, no photographs were obtained by the instrumentation in Florida while it was being operated by Foundation personnel. (Author)

AD-613 555 Div. 2
CFSTI Prices: HC$6.00 MF$1.25

Cornell Univ., Ithaca, N. Y. School of Civil Engineering.
TROPICAL SOILS: CHARACTERISTICS AND AIR-PHOTO INTERPRETATION.
Final rept. for 1 Dec 61-30 Jun 64,
by Ta Liang. 31 Aug 64, 204p
Contract AF19 628 291, Proj. 8623, Task 862302
AFCRL 64-937
Unclassified report

Descriptors: (*Soils, Tropical regions), (*Photogeology, Soil mechanics), Geography, Engineering geology, Agriculture, Central America, South America, Southeast Asia, South Asia, Australia, Aerial photography, Photointerpretation.

To facilitate engineering studies of tropical soils, and particularly their airphoto interpretation, a classification system is proposed which covers major groups of soils peculiar to the tropics, soils common in both tropical and subtropical regions, and soils common in all climates. The origin and formation of tropical soils and their relation to climate, parent material, topography, and age are reviewed. The physical and chemical characteristics, and engineering problems of each of the major soil groups are examined. A method of airphoto interpretation by direct recognition of soil features, and by inference gained from observation of soil-forming factors and circumstances is presented. Air and ground photographs from Central and South America, tropical Africa, Southeast and South Asia, and Australia are included to illustrate a cross section of the major soil groups in the tropics. Recommendations are made for further study toward refining the airphoto interpretation of the major groups and subgroups of tropical soils, in addition to the supplementary use of other remote sensing devices. (Author)

AD-613 559 Div. 2
CFSTI Prices: HC$3.00 MF$0.75

Boeing Scientific Research Labs., Seattle, Wash.

THE SELENODETIC CONTROL SYSTEM OF THE ARMY MAP SERVICE,
by C. L. Goudas. Feb 65, 56p
Mathematical note no. MN-390, D1-82-0409
Unclassified report

Also available from the author.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Moon, Configuration), (*Astronomy, Moon), Extraterrestrial topography, Surveying, Mapping, Army research.

Values of the coefficients of the expansion into surface harmonics of the lunar surface as presented by the Selenodetic Control System of the Army Map Service are derived. Data for the Marginal Zone are taken from the maps of Watts and Hayn and the measurements of Davidson and Brooks, and the far lunar side is assumed to be symmetrical to the near one. It is found that the present results agree with those derived from the data of Schrutka-Rechtenstamm and are close to the figures for a homogeneous Moon as far as the second zonal and sectorial terms are concerned. There is less agreement in the third surface harmonic and even less in the fourth. The results have little resemblance to those derived from Baldwin's data on exactly the same assumptions. It appears that at present the Selenodetic Control System of the Army Map Service should be rated as the best existing source, followed by the data of Schrutka-Rechtenstamm. (Author)

AD-613 565 Div. 2, 8, 30
CFSTI Prices: HC$4.00 MF$1.00

Bissett-Berman Corp., San Diego, Calif.
DEVELOPMENT OF BUOY-MOUNTED OCEANOGRAPHIC SENSORS (BMOS).
Progress rept., phase 2, no. 1,
by Don J. Cretzler, Neil L. Brown, Hugh B. Martin, and Sigmund Miller. 15 Feb 65, 131p
Rept. no. BBC-C104-2
Contract Nonr453200, Proj. NR083 195
Unclassified report

See also AD-606 144.
Descriptors: (*Oceanographi data, Collecting methods), (*Buoys, Data transmission systems), (*Oceanographic equipment, Buoys), (*Monitors, Oceanographic equipment), Power supplies, Batteries and components, Transducers, Electronic equipment, Antifouling coatings, Mechanical drawings, Wiring diagrams.
The activities of this program are directed specifically towards the development of oceanographic sensors capable of continuous reliable operation for one year in situ. The program has three aspects. (1) the study of existing devices such as power sources, sensors, and the PARALOC oscillator; (2) the problems related to marine fouling; (3) the design or redesign as the case may be of circuitry designed specifically to fit the requirements of the BMOS program. These requirements are that the electronics must have a rapid warm-up time, low power, be physically small, and be extremely reliable. The interrogate circuitry, for example, must have fail-safe characteristics in that under no circumstances will one particular telemetry channel remain ON when required to be OFF. The last aspect of this program is the mechanical design of sensor packages, a framework on which the packages will be mounted, and a clamp mechanism which will hold the framework firmly attached to the mooring cable of the buoy system.

AD-613 587 Div. 2
CFSTI Prices: HC$1.00 MF$0.50

Boeing Scientific Research Labs., Seattle, Wash.

THE EFFECTS OF RADIATIVE BRAKING ON FREE PERIODS OF STELLAR PULSATIONS,
by Zdenek Kopal. Jan 65, 25p
Mathematical note no. MN-386, D1-82-0403
Unclassified report

Also available from the author.

Descriptors: (*Equations of state, Stars), (*Stars, Equations of state), (*Astrophysics, Stars), Oscillation, Gases, Spheres, Thermodynamics, Luminescence.

The virial theorem generalised to include the effects of interaction of matter with radiation in stellar interiors is invoked to evaluate the influence of such effects on the fundamental mode of free periods of radial oscillations; and two types of solution are considered in some detail: one of purely harmonic oscillations with phase-lag; the other oscillating in phase throughout the interior, but with complex frequency. It is shown that, in both cases, the interaction terms in the virial theorem introduce the luminosity L of the respective configuration explicitly in the equation for the period, in such a manner as to make the latter increase with L. The quantitative effects of such influence are found to be negligible for configurations of moderate density concentration, and could become appreciable only if this concentration were to become very high. Moreover, the fact that the real art of complex frequency turns out to be positive opens a possibility for the outward flux of radiation to feed energy into radial oscillations of the stars to give them a start if (and only if) the central condensation of such a configuration is sufficiently high. (Author)

AD-613 590 Div. 2, 25
CFSTI Prices: HC$1.00 MF$0.50

Pittsburgh Univ., Pa.
ELECTRONIC AND IONIC COLLISION PROCESSES.
Status rept. nos. 15 and 16, 1 Sep 64-28 Feb 65,
by Manfred A. Biondi. 28 Feb 65, 3p
Contract Nonr62400
Unclassified report

Descriptors: (*Night sky, Gas ionization), (*Neon, Gas ionization), (*Gas ionization, Recombination reactions), Electrons, Ions, Dissociation, Line spectrum.

The status of work involving spectral line profiles in nightglow and from dissociative recombination in neon is briefly summarized.

AD-613 598 Div. 2, 30

National Oceanographic Data Center, Washington, D. C. Data Processing Div.
COMPUTER PROGRAMS IN OCEANOGRAPHY, (PROVISIONAL).
Catalog series, 1964,
comp. by C. Dinger. 1964, 65p NODC-C-5
Unclassified report

Available from U. S. Naval Oceanographic Office, Washington, 20390, D. C., $0.60.

Descriptors: (*Programming (Computers), Oceanology), (*Oceanology, Programming (Computers)), (*Data processing systems, Oceanology), Oceanographic data, Programming languages, Compilers, Bibliographies, Programmers, Handbooks.

This report consolidates the Computer Programs in Oceanography Preliminary List (NODC Progress Report P-12) of June 1963 and the Supplementary List issued September 1963. Revisions and corrections have been made, and a considerable amount of additional material has been included. The listings are arranged, as in previous compilations, alphabetically by agencies and institutions and are grouped by computer make and model. Abstracts of the computer programs have been revised to contain the estimated running time and, under 'Program Description', the error introduced by mathematical techniques used in computation.

AD-613 610 Div. 2, 4
CFSTI Prices: HC$4.00 MF$1.00

Philco, Newport Beach, Calif. Applied Research Labs.
SEA WATER MASS DIFFUSION COEFFICIENT STUDIES.
Final rept. for 1 Jan 63-31 Dec 64,
by John L. Richardson, Paul Bergsteinsson, Richard J. Getz, Donald L. Peters, and Robert W. Sprague. 26 Feb 65, 134p Pub. U-3021, WO-2053
Contract Nonr406100
Unclassified report

Descriptors: (*Sea water, Diffusion), (*Diffusion, Sea water), (*Thermal diffusion, Sea water), Salts, Solutions, Sodium compounds, Chlorides, Physical chemistry, Oceanology.

The ordinary diffusion coefficient and the Soret (thermal diffusion) coefficient were measured for a solution of 3.5 weight percent sodium chloride in water; this system was selected as a reasonable binary simulant to the multicomponent sea water system. Ordinary diffusion coefficients were measured, at 25C, for pressures over the range 1 to 1000 bars; the Soret coefficient was determined at 27C and approximately 1000 bars pressure, and compared to measured values at 1 bar pressure. The influence of pressure on the ordinary diffusion coefficient in 3.5 weight percent NaCl-H2O at 25C was found to be negligible over the pressure range 1 to 1000 bars. Based upon the data from low pressure experiments and a single high pressure experiment in the Soret diffusion apparatus, the Soret coefficient at room temperature likewise appears to be virtually independent of pressure up to 1000 bars. An extensive review and analysis was made of the available literature pertaining to the viscosity and thermal conductivity of multicomponent salt solutions, including sea water. This analysis has shown that these properties are not too different from those of pure water, and can be predicted satisfactorily for engineering purposes by simple additivity relationships based upon the most important salt ions present.

AD-613 611 Div. 2, 20
CFSTI Prices: HC$6.00 MF$1.25

Case Inst. of Tech., Cleveland, Ohio.
PROCEEDINGS OF CONFERENCE ON THE INTERACTION BETWEEN COSMIC RAYS AND HIGH ENERGY PHYSICS HELD SEPTEMBER 25 AND 26, 1964.
1964, 240p
Unclassified report

Descriptors: (*Cosmic rays, Symposia), (*Symposia, Cosmic rays), (*Nuclear physics, Symposia), Cloud chambers, Magnetic fields, Nuclear reactions, Muons, Neutrinos, Measurement, Monitors, Baryons, Bosons, Astrophysics, Gamma rays, Spectrum analyzers, High altitude, Solar radiation, Beta decay, Balloons.

Contents: Magnetic cloud chamber system to study interactions up to 10 to the 12th power ev.; Cosmic ray muon interactions at 5-50 GeV; Neutrino and muon measurements 10,000 ft. underground; Proposed 600-cu m detector for muons and neutrinos; Cosmic ray fluxes and possible experiments; Proposed

balloon-borne system for interactions above 10 to the 11th power ev.; Experiment to detect basic triplets; Proposed system to study interactions at 300 GeV; Relevance of cosmic ray experiments to astrophysics; Proposed solar neutrino experiment; Gamma ray induced showers; Optimum design of magnetic spectrometers, A search for interactions produced by cosmic ray neutrinos; Proposal for high altitude physics experiment; A new approach tothe detection of solar neutrinos via inverse beta decay.

AD-613 615 Div. 2

Naval Oceanographic Office, Washington, D. C.
OCEANOGRAPHY OF THE EASTERN GREAT BAHAMA BANK. PART I. TEMPERATURE-SALINITY DISTRIBUTION,
by Roswell F. Busby and George F. Dick, Jr. Oct 64, 48p Technical rept. no. TR-174
Unclassified report

Available from U. S. Naval Oceanographic Office, Washington, D. C. 20390, $0.80.

Descriptors: (*Oceanology, Atlantic Ocean), (*Atlantic Ocean, Oceanology), Bahamma Islands, Carribbean Sea, Temperature, Salinity, Meteorological charts, Oceanographic data, Tables.

From December 1962 through November 1963 sea surface temperature and salinity measurements were made in the shallow water on the eastern Great Bahama Bank. Surface temperature ranged from 19.5 to 30.0C throughout the sampling period, which represents a 4 to 5C greater variation than in the adjacent deep water channels for the same period. Bank water salinity reached a maximum of 42.00 o/oo in the area immediately west of Eleuthera Island and were as high as 38.00 o/oo in the area south of New Providence Island. Annual variation in salinity was slight; reaching an observed maximum range of 1.00 o/oo. Computations reveal that evaporation exceeds precipitation (E-P) by 39 cm over the eastern banks during the period studied. The high salinity of the bank water is thought to be the result of semi-restricted interchange between the surface water of the deep channels (average salinity 36.50o/oo) and the shallow waters over the bank. A strong thermal gradient is present on the surface from deep to shallow water during 'Northers,' and can be related to the more rapid response of the shoal area to variations in atmospheric conditions than occurs in the adjacent deep channels. (Author)

AD-613 631 Div. 2, 32
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
SOME ECONOMIC ASPECTS OF WEATHER MODIFICATION,
by R. R. Rapp. Apr 65, 13p P-3105
Unclassified report

Prepared for inclusion in the Proceedings of the 1965 Western Snow Conference to be held at Fort Collins, Colo., 20-22 Apr 65.

Descriptors: (*Weather forecasting, Economics), (*Economics, Water supplies), (*Artificial precipitation, Economics), Agriculture, Geography.

In considering the modification of weather, two obvious (but easily underemphasized) necessities are (1) to set forth clearly and completely the nature of the need that is being filled and (2) to align planning with forecasting. An illustration is given of situations in which augmentation of rainfall would and would not be prudent. Another illustration shows that actually controlling the weather would differ in utility from merely precipitating a larger fraction of water from clouds than nature would. (Author)

AD-613 632 Div. 2
CFSTI Prices: HC$4.00 MF$0.75

Air Force Cambridge Research Labs., Bedford, Mass.
AIRGLOW CALIBRATIONS SYMPOSIUM.
Summary,
ed. by G. J. Hernandez and A. L. Carrigan. Dec 64, 105p Special rept. no. SR-22, AFCRL-65-114
Proj. 7661, Task 7661 01
Unclassified report

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Descriptors: (*Sky brightness, Calibration), (*Upper atmosphere, Sky brightness), (*Space environmental conditions, Sky brightness), Symposia, Band spectrum, Optical equipment, Measurement, Standardization.

A symposium on low light level and airglow absolute calibrations was held at the Air Force Cambridge Research Laboratories on 17 and 18 December 1963, and provided an opportunity for participants from various sections of the United States to discuss calibration techniques. The publication contains the proceedings of the symposium. (Author)

AD-613 636 Div. 2
CFSTI Prices: HC$2.00 MF$0.50

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
ON A SOLAR FLARE MODEL AND ITS LABORATORY EXPERIMENTATION.
Technical information series,
by K. T. Yen. Apr 65, 27p Rept. no. R65SD8
Unclassified report

Descriptors: (*Solar flares, Mathematical models), (*Astrophysics, Solar flares), Sunspots, Plasma physics, Hydrogen, Atoms, Correlation techniques, Theory, Experimental data, Thermonuclear reactions, Models (Simulations).

A theoretical model for solar flares is presented to describe the physical processes considered likely to occur in the solar atmosphere above a complex sunspot group leading to the formation and development of a solar flare. Based on the idea that the strong magnetic fields of large sunspots play the dominant role in these processes, a bipolar sunspot group is considered in some detail to show how a very strong magnetic compression can take place to accumulate enough energy to form a solar flare. Estimates of the time scales for solar plasma confinement and the containment of neutral hydrogen atoms are made to show the proposed model to be a feasible one. Physical conditions favorable to the formation of solar flares and the relationship of flares to prominences and filaments are discussed. A laboratory experiment is outlined to verify the validity of the proposed model, and to investigate, within the limitations of laboratory simulation, the physical phenomenon following the flash phase of a 'flare'. (Author)

AD-613 645 Div. 2, 15
CFSTI Prices: HC$1.00 MF$0.50

Boeing Scientific Research Labs., Seattle, Wash.
THE NON-HOMOGENEITY OF THE MOON,

by C. L. Goudas. Mar 65, 11p
Mathematical note no. MN-399, D1-82-0421
Unclassified report

Also available from author.

Descriptors: (*Moon, Geology), (*Density, Moon), Center of mass, Fourier analysis.

The density distribution of the moon is considered in light of the evidence that the center of figure does not coincide with its center of mass. It is concluded that the moon cannot be treated as homogeneous.

AD-613 646 Div. 2, 15

Boeing Scientific Research Labs., Seattle, Wash.
ON THE FIGURE AND GRAVITY FIELD OF THE MOON,
by C. L. Goudas. Feb 65, 18p
Mathematical note no. MN-395, D1-82-0414
Unclassified report

Also available from the author.
Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Moon, Extraterrestrial topography), (*Extraterrestrial topography, Moon), (*Gravity, Moon), Harmonic analysis, Fourier analysis, Surface properties, Mapping.

The absolute position of well-defined point-size features on the lunar surface are determined by harmonic analysis.

AD-613 648 Div. 2
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
THE COMA CLUSTER OF GALAXIES, I: SIZE AND STRUCTURE,
by Guy C. Omer, Jr., Thornton L. Page, and A. G. Wilson. Mar 65, 27p Rept. no. P-3088
Unclassified report

Prepared for submission to the Astronomical Journal. Prepared in cooperation with California Univ., Los Angeles, and Wesleyan Univ., Middletown, Conn.

Descriptors: (*Galaxies, Distribution), (*Astronomy, Galaxies), Counting methods, Photographic recording systems.

Three independent counts of the Coma cluster of galaxies are intercompared. The three different surveys appear to be consistent with each other. It is concluded that this cluster contains some 800 members to photovisual magnitude about 18.5 and is about 100 minutes in radius. A possible spatial density distribution of the galaxies in this cluster is derived from the combined data. (Author)

AD-613 650 Div. 2, 25
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
THE EFFECT OF ELECTRIC CHARGES AND FIELDS ON THE COLLISIONS OF VERY SMALL CLOUD DROPS,
by M. H. Davis. Apr 65, 7p P-3099
Unclassified report

Prepared for the Proceedings of the 1965 International Conference on Cloud Physics in Tokyo, Japan, May 65.

Descriptors: (*Electrostatics, Atmospheric condensation), (*Atmospheric condensation, Electrostatics), Clouds, Moisture, Drops, Trajectories, Hydrodynamics.

The growth of cloud droplets by collision and coalescence is a basic process in the development of precipitation. The paper discusses the influence of electric charges and fields on collisions of small cloud droplets using accurate electrostatic forces (Davis, 1962, 1964) and recently improved values for hydrodynamic forces. Of primary interest are cases where collisions will occur only under the influence of electrostatic forces (Sartor, 1960). Using Hocking's hydrodynamics it was estimated that electrostatic forces began to produce collisions in droplets with radii under 15 microns when alpha exceeded 0.01 esu/sq cm. The effect was most important when the droplets were nearly the same size.

AD-613 665 Div. 2

Woods Hole Oceanographic Institution, Mass.
THE GEOLOGY OF THE WESTERN APPROACHES OF THE ENGLISH CHANNEL. II. GEOLOGICAL INTERPRETATION AIDED BY BOOMER AND SPARKER RECORDS,
by D. Curry, J. B. Hersey, E. Martini, and W. F. Whittard. 5 Dec 63, 47p
Contract Nonr1367
Unclassified report

Pub. in Royal Society of London. Philosophical Transactions. Series B: Biological Sciences v248 n749 p315-51 Jan 14 1965 (Copies available only to DDC users).
Limited number of copies containing color other than black and white are available until stock is exhausted. Reproductions will be made in black and white only.

Descriptors: (*Marine geology, English Channel), (*English Channel, Marine geology), Well logging, Hydrographic sonar, Petrology, Paleontology, Geophysical prospecting, Maps, Oceanographic equipment.

A geological map of about 1700 square miles of the sea-bed south of the Cornish coast between Bolt Head and Fowey was prepared by coring and dredging for rock samples; a boomer-sparker survey was then selected in relation to the supposed geology to fix more precisely the geological boundaries and to ascertain the geological structure of the rocks underlying the sea-bed, in this case to a depth of about 400 ft. The acoustic apparatus is described; the records are interpreted according to mathematical analysis and the probable limits of inaccuracy assessed. Ninety-one rock samples are described lithologically and the microfossils identified in all productive cases to give the stratigraphical ages.

AD-613 698 Div. 2, 30
CFSTI Prices: HC$5.00 MF$1.00

Stanford Research Inst., Menlo Park, Calif.
SURVEY OF ENERGETIC RADIATION AND METEOROIDS IN INTERPLANETARY SPACE.
Final rept.,
by V. Gonzalez, G. L. Johnson, and R. La Canna.
Dec 64, 169p
Contract N228 62479 65358, Proj. 5037
Unclassified report

Descriptors: (*Space environmental conditions, Space probes), (*Meteors, Space probes), (*Solar radiation, Space probes), (*Cosmic rays, Space probes), Radiation measurement systems, Calibration, Van Allen radiation belt, Astrophysics.

The empirical characteristics of the environmental

factors affecting the design, operation, calibration, testing, and on-line performance requirements of radiation sensors intended for operation in the interplanetary environment are surveyed. The environmental factors surveyed and discussed include ionizing electromagnetic radiation, corpuscular radiation of both solar and galactic origin, and meteoroids. The survey is limited to the radiations and meteoroids existing in the region outside of the earth's magnetosphere. Where possible the survey is based on observations made with space probes located beyond the magnetosphere. Where data from deep space probes are not available, the characteristics of the environmental factors have been estimated from measurements made at or near the surface of the earth. (Author)

AD-613 724 Div. 2, 30

Washington Univ., Seattle.
A GRAVIMETRIC METHOD FOR DETERMINING SUSPENDED MATTER IN SEA WATER USING MILLIPORE FILTERS,
by K. Banse, C. P. Falls, and L. A. Hobson.
6 May 63, 5p Technical rept. no. TR-104
Contract Nonr47710, Proj. NR083 012
Unclassified report

Pub. in Deep-Sea Research and Oceanographic Abstracts (Gt. Brit.) v10 p639-42 1963 (Copies available only to DDC users).

Descriptors: (*Sea water, Gravimetric analysis), (*Water filters, Sea water), Colloids, Plankton, Weight, Porosity.

A modification of earlier methods for the determination of the weight of suspended matter in 0.5 to 51. of sea water is presented. Filter pore size can be selected to meet the requirements of the experiment. The precision is ± 0.15 mg at the 95 per cent level. The material can be subjected to subsequent analysis if the presence of the filter does not interfere. (Author)

AD-613 725 Div. 2

Scripps Institution of Oceanography, Univ. of California, La Jolla.
BATHYMETRY OF THE BEAUFORT SEA,
by A. J. Carsola, R. L. Fisher, C. J. Shipek, and George Shumway. 1959, 13p
Contract Nonr221601, Proj. NR083 005
Unclassified report

Pub. in mono. Geology of the Arctic, pub. Univ. of Toronto Press, p678-89 1961
(Copies available only to DDC users).

Descriptors: (*Depth finding, Arctic Ocean), Oceanographic data, Echo ranging, Ocean bottom topography, Hydrographic surveying, Sedimentation, Photographs, Icebreakers, Arctic regions.

Oceanographic studies of the Beaufort Sea were made from ice-breakers during the summers of 1951, 1957, and 1958. Numerous echo-sounding lines were made across the shelf and slope, and into the deep Canada Basin. Between the Colville and Mackenzie River deltas, the shelf has a width of about forty nautical miles with a shelf edge as shallow as thirty-five fm. The upper slope is relatively steep; on the lower slope the inclination decreases as depth increases. The floor of the Canada Basin near the continental slope is flat and featureless. East of Barter Island, the slope character changes because of the presence of the Mackenzie River and the Mackenzie Sea valley. Still further east lies Amundsen Trough at the outer end of Amundsen Gulf. This trough is a feature of glacial origin and the westernmost unfilled trough of the Canadian Archipelago. Sea-floor photographs on the slope and in the deep basin show a flat, featureless bottom without evidence of ice-rafted pebbles. (Author)

AD-613 740 Div. 2, 4

Oregon State Univ., Corvallis.
PARTIAL EQUIVALENT CONDUCTANCE OF ELECTROLYTES IN SEA WATER,
by Kilho Park. 20 Apr 64, 9p
Contract Nonr128610; Grant NSF GP622,
Proj. NR083 102
Unclassified report

Pub. in Deep-Sea Research and Oceanographic Abstracts (Gt. Brit.) v11 p729-36 1964 (Copies available only to DDC users).

Descriptors: (*Sea water, Electrical conductance), (*Electrolytes, Electrical conductance), Sodium compounds, Potassium compounds, Magnesium compounds, Calcium compounds, Strontium compounds, Chlorides, Bromides, Sulfates, Carbonates, Phosphates, Hydroxides, Hydrochloric acid, Ionic current, Salinity.

The partial equivalent conductances of sixteen electrolytes were measured in sea water. The electrolytes studied are: NaCl, KCl, MgCl2, CaCl2, SrCl2, Na2SO4, K2SO4, MgSO4, NaHCO3, KHCO3, Na2CO3, K2CO3, KH2PO4, KBr, HCl and NaOH. The equivalent conductance was obtained by comparing the specific conductance before and after the addition of one of the above electrolytes to sea water. Conductance ranged from 23/OHM sq cm for Na2CO3 to 310/OHM sq cm for HCl at 35.00 0/00 salinity and at 23C. (Author)

AD-613 744 Div. 2

Oregon State Univ., Corvallis.
OXYGEN EXCHANGE RATES OFF THE OREGON COAST,
by Ricardo M. Pytkowicz. 6 Apr 64, 10p
Contracts Nonr128610, Proj. NR083 102
Unclassified report

Pub. in Deep-Sea Research and Oceanographic Abstracts (Gt. Brit.) v11 p381-9 1964 (Copies available only to DDC users).
Prepared in cooperation with Washington Univ., Seattle, Contract Nonr47710.

Descriptors: (*Pacific Ocean, Oxygen), (*Oxygen, Sea water), Solubility, Diffusion, Surfaces, Oceanology.

A subsurface oxygen maximum is formed in summer as the water temperature rises, as a result of loss of oxygen above the layer in which the maximum occurs. Rates of oxygen exchange and eddy diffusivities are estimated. The exchange coefficient is of the same order of magnitude as that found by Redfield in the Gulf of Maine. (Author)

AD-613 745 Div. 2

Seismological Lab., Calif. Inst. of Tech., Pasadena.
UPPER MANTLE STRUCTURE UNDER OCEANS AND CONTINENTS FROM RAYLEIGH WAVES,
by Keiti Aki and Frank Press. 7 Feb 61, 14p
Contract AF49 638 910
AFOSR 2967
Unclassified report

Pub. in Geophysical Journal (Gt. Brit.) v5 n4 p292-305 1961 (Copies available only to DDC users).

Descriptors: (*Marine geology, Seismology), (*Seismology, Marine geology), Lithosphere, Structural geology, Marine geophysics, Seismic waves, Propagation, Pacific Ocean, Atlantic Ocean, Indian Oceans, Models (Simulations).

Theoretical seismograms of Rayleigh waves based on several models of mantle structure are compared with actual records for various paths. It is found that the model 8099 of Dorman, Ewing and Oliver explains seismograms for Pacific paths but does not agree with records from Indian-Atlantic ocean paths in the period range shorter than about 100s. The velocity of the Airy phase corresponding to the group velocity maximum is about 0 times 10 km/s lower for the Indian-Atlantic path than for the Pacific. This difference can be accounted for by reducing the shear velocity at the top of the mantle under the Indian and Atlantic oceans by about 0 times I-0 times 2 km/s. The difference between the Pacific mantle and the Continental mantle can be explained either by a reduction in shear velocity of the low-velocity layer under the Pacific ocean or by making the low-velocity zone shallower. (Author)

AD-613 748 Div. 2, 4

Washington Univ., Seattle.
CALCIUM CARBONATE AND THE IN SITU pH,
by Ricardo M. Pytkowicz. 13 May 63, 7p
Technical rept. no. TR-109
Contract Nonr47710

Unclassified report

Pub. in Deep-Sea Research and Oceanographic Abstracts (Gt. Brit.) v10 p633-8 1963 (Copies available only to DDC users).

Descriptors: (*Ocean bottom, pH), (*Sea water, pH), (*Calcium compounds, Carbonates), Acids, Dissociation, Solubility, Hydrostatic pressure, Sedimentary rock, Chemical equilibrium.

The effect of hydrostatic pressure on the dissociation constants of carbonic acid and on the solubility product of calcium carbonate are used for estimating the effect of depth and of calcareous sediments on the in situ pH. (Author)

AD-613 750 Div. 2, 20

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
SEARCH FOR ALUMINUM-26 IN DUST FROM THE GREENLAND ICE SHEET,
by Edward L. Fireman and Chester C. Langway, Jr.
29 Jul 64, 8p

Unclassified report

Pub. in Geochimica et Cosmochimica Acta (Netherlands) v29 p21-7 1965 (Copies available only to DDC users).

Descriptors: (*Geochemistry, Greenland), (*Aluminum, Geochemistry), (*Greenland, Geochemistry), Meteorites, Isotopes, Extraterrestrial topography, Dust, Ice, Collecting methods, Geologic age determination, Radiation measurement systems, Astrophysics, Geophysics, Silicates, Thallium, Thorium.

Large volumes of approximately 250-year-old Greenland glacier ice were filtered. Approximately 20,000 liters passed through 0.45 micron retention paper with a 2.5 ft surface area, and approximately 200,000 l. passed through 3 micron retention paper. Less than 4 x 10/> dpm/l. of aluminum-26 was found in the 3 micron collections, and less than 3 x 10/6 dpm/1. in the 0.45 micron collection. These limits are significant for determinations of the exposure age, the chemical composition, and the accretion rate of extraterrestrial dust. For an accretion rate for the Earth of a million tons per year of silicates, the limit of 4 x 10/> dpm/1. corresponds to an exposure age of 4000 years. Although the filter collections do not contain aluminum-26, they do contain radioactivities. The principal one is thallium-208, a thorium decay product attributed to terrestrial material in the collection. There is also a small positron activity, which disappeared with the purification of aluminum. (Author)

AD-613 755 Div. 2

Air Force Cambridge Research Labs., Bedford, Mass.
ROCKET OBSERVATIONS OF SLOW HEAVY PRIMARY NUCLEI AT KRONOGARD, SWEDEN,
by H. Yagoda, K. Fukui, E. Holeman, K. Kristiansson, and B. Lindkvist. 6 Mar 64, 7p
Grant AF EOAR64 35
AFOSR 65-0461

Unclassified report

Pub. in Nuovo Cimento (Italy) v34 (Ser10) p854-9 Nov 16 1964 (Copies available only to DDC users)
Prepared incooperation with Emmanuel Coll., Boston, Mass.
Contract AF19 628 3828; Lund Univ. (Sweden),
Grant AF EOAR62 71.

Descriptors: (*Ionosphere, Nuclei), (*Nuclei, Ionosphere), Nucleons, Colloids, Solar radiation, Sounding rockets, Geophysics, Detection, Sweden.

Small emulsion blocks recovered from a series of Nike-Cajun rockets launched from Kronogard, Sweden exhibit the tracks of slow heavy primary nuclei which stop by ionization in the detectors. The charge distribution of these particles, estimated from track width measurements, is consistent with a galactic origin. The kinetic energy of the particles estimated from their range resides between 60 and 570 MeV per nucleon. This preliminary experiment suggests that important information on the charge and energy spectra can be secured by exposing large areas of emulsion in geophysical sounding rockets. (Author)

AD-613 756 Div. 2

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
ON THE DENSITY OF METEOROIDS. II. THE DENSITY OF FAINT PHOTOGRAPHIC METEORS,
by F. Verniani. 10 Apr 64, 14p

Unclassified report

Pub. in Nuovo Cimento (Italy) v33 Ser10 p1173-84 Aug 16 1964 (Copies available only to DDC users).

Descriptors: (*Meteors, Density), (*Astrophysics, Meteors), Comets, Asteroids, Extraterrestrial topography, Optical properties, Photographic analysis.

The density of 359 photographic meteors, reduced by Hawkins and Southworth, has been computed with a procedure that uses the height of maximum light and does not require the use of the deceleration. The reliability of the method is discussed. It is shown that neither fragmentation nor other known causes can have a large effect on the results. The meteoroids turn out to have a mean density much smaller than 1 g/cc. The average density of the sporadic meteors, according to the present analysis, is about 0.2 g/cc. The densities of the members of the principal showers have also approximately the same value.

These low densities conform to expectation on the basis of Whipple's icy-comet model and agree with the porous and crumbling structure shown by all photographic meteors but the brightest fireballs. The meteor density obtained in the present analysis is essentially the same as that previously obtained by the author for the photographic meteors precisely reduced by Jacchia. It is confirmed that short-period meteors have on the average a greater density than meteors with elongated orbits. No conclusive evidence was found in the Hawkins-Southworth material for any meteor of definite asteroidal origin. (Author)

AD-613 769 Div. 2

Air Force Cambridge Research Labs., Bedford, Mass.
ZONAL AND MERIDIONAL WINDS TO 120 KILOMETERS.
Revised ed.,
by A. J. Kantor and A. E. Cole. 21 Sep 64, 18p
AFCRL 65-79, AFSIG-161
Proj. 8624

Unclassified report

Pub. in Journal of Geophysical Research (U.S.) v69 n24 p5131-40 Dec 15 1964.
Copies not available to DDC or Clearinghouse customers.
Revision of rept. dated 14 Feb 64.

Descriptors: (*Wind, Stratosphere), Measurement, Graphics, Statistical data, Climatology, Geophysics, Diurnal variations.

Estimated January and July zonal wind patterns are described to 120 km from the equator to 75N. Time cross sections of mean monthly zonal winds to 120 km for latitudes 30 and 60N are also shown. Day-to-day fluctuations of zonal and meridional winds between 25 and 65 km are greater in January than in July and appear larger during the day than at night. These data indicate that a monthly wind climatology prepared for various times of day would provide improved estimates of the wind for specific times and altitudes. Also, it is suggested that the large observed diurnal variability of zonal winds at heights between 90 and 120 km may be partially due to a nocturnal contraction and daytime expansion of the atmosphere. (Author)

AD-613 770 Div. 2, 12, 25

Air Force Cambridge Research Labs., Bedford, Mass.
ANALYSIS AND INTERPRETATION OF TIROS II INFRARED RADIATION MEASUREMENTS,
Revised ed.,
by R. S. Hawkins. 6 May 64, 18p
Rept. no. AFCRL 65-80, ERP-81
Proj. 6698 Task 6698 03

Unclassified report

Pub. in Journal of Applied Meteorology (U. S.) v3 n5 p564-72 Oct 1964.
Copies not available to DDC or Clearinghouse customers.
Revision of Manuscript submitted 6 Mar 64.

Descriptors: (*Meteorological satellites, Infrared scanning), (*Infrared radiation, Geophysics), Air mass analysis, North America, Cloud cover, Weather forecasting, Radiometers.

Infrared radiation data obtained by the TIROS II meteorological satellites are discussed in relation to a frontal system over North America. It appears from this study that the radiation data may be useful not only for determining the location, motion and development of frontal systems but also for obtaining information on the structure of frontal zones. A detailed analysis is made of data for a cloudy cold front in regard to cloud and moisture distributions. The infrared data define the regions of convective activity quite accurately. For the case studied, the data suggest a relatively dry region in the upper troposphere above the surface front. Potentialities of the data are discussed. Possible explanations for reported discrepancies between the satellite data and conventional data are presented. (Author)

AD-613 771 Div. 2

Air Force Cambridge Research Labs., Bedford, Mass.
TOTAL ENERGY AND ENERGY SPECTRAL DENSITY OF ELASTIC WAVE RADIATION FROM PROPAGATING FAULTS,
by N. A. Haskell. 9 Aug 64, 37p AFCRL 65-123, ERP-86
Proj. 7639, Task 7639 02

Unclassified report

Pub. in Seismological Society of America. Bulletin (U.S.) v54 n6 p1811-41 Dec 1964
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Seismology, Faults (Geology)), Seismic waves, Propagation, Energy, Elasticity, Shear stresses, Green's function, Mathematical analysis, Earthquakes.

Starting with a Green's function representation of the solution of the elastic field equations for the case of a prescribed displacement discontinuity on a fault surface, it is shown that a shear fault is rigorously equivalent to a distribution of double-couple point sources over the fault plane. In the case of a tensile fault the equivalent point source distribution is composed of force dipoles normal to the fault plane with a superimposed purely compressional component. Assuming that the fault break propagates in one direction along the long axis of the fault plane and that the relative displacement at a given point has the form of a ramp time function of finite duration, T, the total radiated P and S wave energies and the total energy spectral densities are evaluated in closed form in terms of the fault plane dimensions, final fault displacement, the time constant T, and the fault propagation velocity. Using fault parameters derived principally from the work of Ben-Menahem and Toksoz on the Kamchatka earthquake of November 4, 1952, the calculated total energy appears to be somewhat low and the calculated energy spectrum appears to be deficient at short periods. It is suggested that these discrepancies are due to over-simplification of the assumed model, and that they may be corrected by (1) assuming a somewhat roughened ramp for the fault displacement time function to correspond to a stick-slip type of motion, and (2) assuming that the short period components of the fault displacement wave are coherent only over distances considerably smaller than the total fault length. (Author)

AD-613 772 Div. 2, 25

Air Force Cambridge Research Labs., Bedford, Mass.
IMPROVED EXTREME ULTRAVIOLET ABSORPTION MEASUREMENTS IN THE UPPER ATMOSPHERE.
Revised ed.,
by L. A. Hall, W. Schweizer, and H. E. Hinteregger.
5 May 64, 15p AFCRL 65-124, ERP-87
Proj. 6688, Task 6688 01

Unclassified report

Pub. in Journal of Geophysical Research (U.S.) v70 n1 p105-11 Jan 1 1965.
Copies not available to DDC or Clearinghouse customers.
Revision of rept. dated 2 Mar 64.

Descriptors: (*Upper atmosphere, Ultraviolet spectroscopy), (*Ultraviolet spectroscopy, Upper atmosphere), (*Atmospheric sounding, Ultraviolet spectroscopy), Solar radiation, Ultraviolet radiation, Absorption spectrum, Nitrogen, Oxygen, Photoelectric effect, Ionization, Sounding rockets, Instrumentation.

The evaluation of improved measurements of atmospheric absorption characteristics at nine wavelengths of solar extreme ultraviolet radiation, conducted on July 10, 1963, at 1004 A.M. over White Sands, N. M., leads to data on the vertical distribution of N2, O, and O2 which are tabulated for altitudes from 150 to 220 km. These data may be fairly typical for the thermosphere at moderate northern latitudes, a zenith angle of about 30 degrees and for most of July 1963, a month of generally quiet solar conditions. (Author)

AD-613 824 Div. 2, 20

Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.
LOCAL TIME DEPENDENCE OF NON-STORMER CUTOFF FOR 1.5-MEV PROTONS IN QUIET GEOMAGNETIC FIELD.
Doctoral thesis,
by Edward C. Stone. 1 Jun 64, 7p
Contract AF49 638 1008; Grant AF AFOSR62 23 AFOSR 65-0469

Unclassified report

Pub. in Journal of Geophysical Research (U. S.) v69 n17 p3577-82 Sep 1 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of rept. dated 17 Feb 64.

Descriptors: (*Atmospheric sounding, Polar regions), (*Protons, Geophysics), (*Terrestrial magnetism, Protons), Solar radiation, Solar flares, Polar orbit trajectories, Scientific satellites, Cosmic ray telescopes, Magnetic storms, Nuclear particles.

Two solid-state detector telescopes, vertically and horizontally oriented, were launched into a polar orbit during a time of low geomagnetic activity. A small flux of 1.5-Mev protons, interacting with the geomagnetic field as individual particles, was observed at all latitudes above a characteristic cutoff latitude. The observed vertical cutoff was 65 degrees (equivalent dipole latitude) on the night side and 67 degrees on the day side, as compared with a theoretical Stormer cutoff of 76 degrees. The local time dependence was also apparent in the cutoff transition width characterized by the difference in the latitude at which the flux is first detectable and the latitude at which the maximum (plateau) flux is first observed. On the night side, the transition width was about 1 degree; on the day side it was about 3 degrees and variable. The horizontal cutoff latitudes were similar. Essentially identical results were obtained over north and south poles. These results are not adequately predicted by currently postulated cutoff theories and should be considered in the calculation of proton fluxes associated with polar-cap absorption. (Author)

AD-613 825 Div. 2

Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.
A MEASUREMENT OF THE PRIMARY PROTON FLUX FROM 10 TO 130 MILLION ELECTRON VOLTS.
Doctoral thesis,
by Edward C. Stone. 13 May 64, 9p
Contract AF49 638 1008; Grant AF AFOSR62 23 AFOSR 65-0470

Unclassified report

Pub. in Journal of Geophysical Research (U. S.) v69 n19 p3939-45 Oct 1 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 17 Feb 64.

Descriptors: (*Atmospheric sounding, Polar regions), (*Protons, Geophysics), Nuclear particles, Alpha particles, Solar radiation, Gold, Silicon, Solid state physics, Proton counters, Scientific satellites, Polar orbit trajectories.

A counter telescope, composed of nine AuSi solid-state detectors for measuring the energy loss and range of vertically incident particles, was carried into a polar orbit by an oriented satellite on December 12, 1961. The choice of detectors and absorbers allowed separation of protons and alpha particles with energies between 10 and 250 Mev/nucleon. Although the quantity of data was limited by the failure of the vehicle transmitter, both the observed 85- to 130-Mev proton flux and the alpha-particle flux are consistent with other 1961 observations. In addition, a proton flux of about 1/sq m/sec/ster/Mev was measured in the energy range 10-85 Mev, indicating that the quiet time spectrum was much 'flatter' than the 1/sq E spectrum that others have observed at higher energies. (Author)

AD-613 829 Div. 2

Illinois Univ., Urbana.
THE TECTONIC STRESS AND TECTONIC MOTION DIRECTION IN THE PACIFIC AND ADJACENT AREAS AS CALCULATED FROM EARTHQUAKE FAULT PLANE SOLUTIONS,
by A. E. Scheidegger. 13 Oct 64, 6p
Grant AF AFOSR62 419

Unclassified report

Pub. in Seismological Society of America. Bulletin (U. S.)v55 n1 p147-52 Feb 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Seismology, Pacific Ocean), (*Pacific Ocean, Seismology), (*Earthquakes, Pacific Ocean), Faults (Geology), Marine geology, Matrix algebra.

The best P and T axes as well as the best normals to the null directions were calculated for groups of earthquake fault plane solutions belonging to 29 areas of the Pacific Basin and vicinity. The method employed was one developed in an earlier paper of the writer; it is based on a calculation of the eigenvectors of a quadratic form. It is shown that the principal horizontal stress (PHS) directions obtained in this fashion are in excellent agreement with those obtained from other evidence. In the Western Pacific Basin and vicinity the calculations were sufficiently dense to determine PHS trajectories; the latter are shown and yield a consistent picture of the area in question. (Author)

AD-613 830 Div. 2

Scripps Institution of Oceanography, Univ. of California, La Jolla.
GUYOTS IN THE SOUTHWESTERN PACIFIC BASIN,
by H. W. Menard, S. M. Smith, and T. E. Chase.
17 Jun 63, 4p
Contract Nonr221612, Proj. NR083 005 Unclassified report

Pub. in Geological Society of America. Bulletin (U. S.) v75 p145-8 Feb 1964 (Copies not available to DDC or Clearinghouse customers)
Prepared in cooperation with Biological Lab., Bureau of Commercial Fisheries, San Diego, Calif.

Descriptors: (*Mountains, Ocean bottom topography), (*Marine geology, Pacific Ocean), (*Pacific Ocean, Ocean bottom topography), Volcano islands, Petrology, Structural geology, Volcanoes.

Four guyots in a northwest trending group of guyots, 2000 km east of New Zealand, have reliefs of 4200-4500 m and shelf break depths of 700, 880, 900, and 920 m. Blocky and tabular cobbles of olivine basalt and detrital rock were dredged from one of the guyots. The structural province characterized by northwest trending lines of volcanoes has greater extent to the southwest than previously known and comes into contact with the sub-continental Tonga-Kermadec and Fiji structures. (Author)

AD-613 833 Div. 2

Washington Univ., Seattle.
SEDIMENTATION IN A HIGH ENERGY, EMBAYED, CONTINENTAL SHELF ENVIRONMENT,
by Joe S. Creager. 5 Mar 62, 16p
Technical rept. no. TR-101
Contracts AT45 1 540, Nonr47710, Proj. NR083 012
Unclassified report

Pub. in Journal of Sedimentary Petrology (U. S.) v33 n4 p815-30 Dec 1963 (Copies not available to DDC or Clearinghouse customers)
Presented at the Annual Meeting of the Society of Economic Paleontologists and Mineralogists (35th), held at Denver, Colo., 1961.

Descriptors: (*Marine geology, Chukchi Sea), (*Sedimentation, Chukchi Sea), Geological survey, Oceanology, Maps.

The continental shelf area immediately north of Seward Peninsula, Alaska, is characterized by medium-to coarse-grained clastic sediments and dominated by stronger than normal offshore currents. The pattern of current velocities is compared with the bathymetry, the distribution of sediment size and sorting characteristics, and the proximity of source areas. (Author)

AD-613 834 Div. 2

Washington Univ., Seattle.
COMPARATIVE EVALUATION OF THREE TECHNIQUES OF PIPETTE ANALYSIS,
by Joe S. Creager and R. W. Sternberg. 16 Mar 62, 6p Technical rept. no. TR-102
Contract Nonr477 10, Proj. NR083 012
Unclassified report

Pub. in Journal of Sedimentary Petrology (U. S.) v33 n2 p462-6 Jun 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Sedimentation, Test methods), Ocean bottom sampling, Pipettes, Analysis, Petrology, Marine geology.

A large sample of marine sediment was ground to diameters less than 62 microns and divided into 17 sub-samples. Five of these sub-samples were shaken in distilled water, centrifuged, and filtered to determine the losses incurred by this process of desalting. The remaining 12 subs-amples were similarly desalted and each subjected to 10 initial aliquot measurements to determine how precisely the initial aliquot measured the quantity of fines being pipetted. Concurrent with this, 14 Recent marine sediments were filtered after pipetting was completed. The quantity of recovered sediment was statistically compared to the assumed or previously determined concentrations. These data were used for the statistical evaluation of three different estimates commonly used to determine fine fractions. These are (a) assumed fine fraction (weight of fines before desalting), (b) corrected fine fraction (weight of fines after desalting), (c) initial aliquot (weight of fines indirectly determined by pipetting the suspension). Desalting losses were found to be significant for the sediment used, making the assumed fine fraction weight in error by the quantity lost. The corrected fine fraction technique accurately measures the fines, but this technique is slightly more difficult than the others. The initial aliquot was found to measure the quantity of fine fraction in the cylinder adequately. Since this method requires no drying of the sediment, complete dispersion is more readily assured. (Author)

AD-613 837 Div. 2

Washington, Univ., Seattle.
PROCESSES CONTRIBUTING TO THE NUTRIENT DISTRIBUTIONS OFF THE COLUMBIA RIVER AND STRAIT OF JUAN DE FUCA,
by Unnsteinn Stefansson and Francis A. Richards. 1964, 18p Technical rept. no. TR-106
Contracts AT45 1 1725, Nonr47710, Proj. NR083 012
Unclassified report

Pub. in Limnology and Oceanography (U. S.) v8 n4 p394-410 Oct 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Juan De Fuca Strait, Inorganic compounds), (*Rivers, Oregon), (*Oceanology, Juan De Fuca Strait), Hydrology, Washington, Salinity, Oxygen, Silicates, Nitrates, Phosphates, Geochemistry, Biology.

The distribution of salinity, dissolved oxygen, silicate, nitrate, and phosphate off the Washington and Oregon coasts, both inside and outside the Columbia River plume, were observed during 12 cruises of the RV Brown Bear between January 1961 and April 1962. Nutrients are supplied to the surface waters off the Washington and Oregon coasts from rivers and from the deeper layers of the ocean. The deep water enters the surface layers by entrainment, especially in the estuarine-like circulation in the Strait of Juan de Fuca; by upwelling, particularly off the Oregon coast in summer; and by upward mixing into the photic zone. The most important river source of nutrients is the Columbia River, which supplies high concentrations of phosphate and nitrate to its 'plume,' those waters appreciably diluted by its admixture. In winter, the plume waters are approximately simple mixtures of Columbia River and surface seawater, and their silicate and nitrate concentrations can be predicted from the salinity. In the spring and summer, nutrients are also added by the admixture of upwelled deep water and removed by photosynthetic fixation. The amounts thus added or removed have been estimated as departures, or anomalies, from the composition of simple mixtures of river and surface seawaters. (Author)

AD-613 838 Div. 2

Washington Univ., Seattle.
COMMENT ON THE VARIATION OF SOLUBILITY WITH DEPTH,
by Ricardo M. Pytkowicz and I. M. Klotz.

1964, 1p Technical rept. TR-107
Contract Nonr477 ?0, Proj. NR083012
Unclassified report

Pub. in Limnology and Oceanography (U. S.) v8 n4 p486 Oct 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Oceanology, Gases), (*Gases, Solubility), Oceans.

AD-613 839 Div. 2. 4

Oregon State Univ., Corvallis.
ELECTROLYTIC CONDUCTANCE OF SEA WATER: EFFECT OF CALCIUM CARBONATE DISSOLUTION,
by Kilho Park. 29 Jul 64, 2p
Contract Nonr128610; Grant GP-2232, Proj. NR083 102
Unclassified report

Pub. in Science (U. S.) v146 n3640 p56-7 Oct 2 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Sea water, Electrical conductance), (*Calcium compounds, Carbonates), Salinity, Density, Carbon dioxide, Bicarbonates, Solubility, pH, Electrochemistry.

Calcium carbonate dissolution in the presence of excess carbon dioxide increased the specific conductance of sea water by approximately 0.00006/ohm/cm per millimole of carbonate dissolved. The observed conductance increase can be explained by the partial equivalent conductance of calcium bicarbonate and by the hindrance effect of uncharged carbon dioxide dissolved in sea water. (Author)

AD-613 840 Div. 2

Oregon State Univ., Corvallis.
AN EROSIONAL CLASSIFICATION FOR THE NORTHERN OREGON COAST,
by John V. Byrne. Sep 64, 7p
Contract Nonr1286 10
Unclassified report

Pub. in Association of American Geographers. Annals (U. S.) v54 n3 p329-35 Sep 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Erosion, Seacoast), (*Oregon, Seacoast), (*Marine geology, Oregon), (*Seacoast, Erosion), Beaches, Configuration, Classification.

The specialized coastal classification proposed in this paper subdivides the northern coast of Oregon according to the geologic factors which control erosion and are largely responsible for the present shape of the coastline. This is a refinement of an earlier classification which combined types of erosion control with types of coastal sedimentary deposits.

AD-613 842 Div. 2

Wisconsin Univ., Madison. Dept. of Meteorology.
THE VEGETATION OF THE ENNADAI LAKE AREA, N.W.T.: STUDIES IN SUBARCTIC AND ARCTIC BIOCLIMATOLOGY,
by James A. Larsen. Jan 65, 24p Technical rept. no. TR-18
Contract Nonr1202 07, Proj. NR387 022
Unclassified report

Pub. in Ecological Monographs (U. S.) v35 n1 p37-59 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Northwest territories, Plants (Botany)), (*Climatology, Northwest territories), Arctic regions, Trees, Ecology, Permafrost, Atmospheric temperature, Snow, Lakes, Permafrost, Geological survey, Canada.

This study represents an effort to delineate more clearly the relationship between plant communities and climate in central northern Canada. Analysis of plant communities in the region of treeline at Ennadai Lake, Northwest Territories (61 N, 101 W), and observations on the environmental relationships and past history of the spruce forest establish the existence of an abrupt vegetational ecotone in this area, corroborating available evidence which indicates that a rather distinct climatic transition also prevails in the region. (Author)

AD-613 844 Div. 2

Palmer Physical Lab., Princeton Univ., N. J.
COSMOLOGY AND NEWTONIAN MECHANICS.
Technical rept.,
by C. Callan, R. H. Dicke, and P. J. E. Peebles.
12 May 64, 6p
Contract Nonr185830, Proj. NR019 627
Unclassified report

Pub. in American Journal of Physics (U. S.) v33 n2 p105-8 Feb 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Relativity theory, Celestial mechanics), (*Astronomy, Relativity theory), (*Celestial mechanics, Relativity theory), Partial differential equations, Astrophysics.

The general relativistic solution to the cosmological problem is often considered to be one of its most beautiful results. It is shown that Newtonian mechanics is quite sufficient to discuss the dynamics of the expanding universe. Furthermore, this is not a cleverly contrived classical model, or a crude non-relativistic approximation, but a completely correct discussion of the dynamics of the expansion in a region where both general relativity and Newtonian mechanics are equally valid. (Author)

AD-613 846 Div. 2

Minnesota Univ., Minneapolis. School of Physics.
STRATOSPHERE AND TROPOSPHERE: TRANSPORT OF MATERIAL BETWEEN THEM,
by John L. Kroening. 9 Dec 64, 2p
Contract Nonr71022
Unclassified report

Pub. in Science (U. S.) v147 n3660 p862-4 Feb 19 1965 Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Stratosphere, Transport properties), (*Troposphere, Transport properties), (*Atmospheric sounding, Transport properties), Ozone, Dust, Aerosols, Measurement, Meteorological balloons, Atmospheric motion.

Data from two almost simultaneous balloon soundings show that ozone and dust in combination are transported from their stratospheric reservoirs into the troposphere by way of thin laminae measuring about 1 kilometer vertically by at least 480 kilometers horizontally. Trans-

port in this layer occurs across the top of the jet stream in a region of very great vertical wind shear. Stratospheric aerosol may be an important instrument for the destruction of ozone within the stratosphere. (Author)

AD-613 864 Div. 2, 6

Seismological Lab., Calif. Inst. of Tech., Pasadena.
DETERMINATION OF SOURCE PARAMETERS BY AMPLITUDE EQUALIZATION OF SEISMIC SURFACE WAVES. 2. RELEASE OF TECTONIC STRAIN BY UNDERGROUND NUCLEAR EXPLOSIONS AND MECHANISMS OF EARTHQUAKES.
Revised ed.,
by M. Nafi Toksoz, David G. Harkrider, and Ari Ben-Menahem. 11 Nov 64, 16p
Contract AF49 638 1337

Unclassified report

Pub. in Journal of Geophysical Research (U. S.)
v70 n4 p907-22 Feb 15 1965 (Copies not available to DDC or Clearinghouse customers).
Revision of manuscript submitted 18 Sep 64.
See also AD-612 213.

Descriptors: (*Underground explosions, Seismology), (*Seismology, Underground explosions), (*Earthquakes, Sources), Seismic waves, Nuclear explosions, Strain (Mechanics), Energy.

The radiation patterns of Love and Rayleigh waves from three nuclear explosions are studied to determine the nature of the asymmetry of radiation and the mechanism of Love wave generation. From a comparative study of different explosions it is reasoned that the Love waves are generated at the source of the explosion. The source function, represented as the superimposition of an isotropic dilatational component due to the explosion and a multipolar component due to the release of tectonic strain energy, is consistent with the observed radiation patterns and the amplitude spectrums. The amount of seismic energy due to the strain release is computed. In some cases it is found that this energy may be due to the relaxation of the pre-stressed medium by the explosion-formed cavity. It has been concluded that the explosion must have triggered some other strain release mechanism, such as an earthquake. The amplitude equalization method is applied to surface waves from an earthquake to determine the source parameters. (Author)

AD-613 869 Div. 2

New York Univ., N. Y. School of Engineering and Science.
THE INTERPRETATION OF WAVE SPECTRUMS IN TERMS OF THE WIND PROFILE INSTEAD OF THE WIND MEASURED AT A CONSTANT HEIGHT.
Revised ed.,
by Willard J. Pierson, Jr. 22 Sep 64, 13p
Contract N62306 1042

Unclassified report

Pub. in Journal of Geophysical Research (U.S.) v69 n24 p5191-203 Dec 15 1964
Copies not available to DDC or Clearinghouse customers.
Revision of manuscript submitted 9 Apr 64.

Descriptors: (*Ocean waves, Wind), (*Wind, Ocean waves), Marine meteorology, Drag, Turbulence, Hydrodynamics, Graphics.

The variation of the mean wind with height (as a function of the variously proposed drag coefficients) affects the interpretation of wave spectrums for fully developed seas. It is found that the effect brings the results of Neumann, Wilson, and Moskowitz and Pierson into closer agreement. Further improvement in wave theory will depend on the solution of problems in turbulence and on more precise measurements of waves and winds at sea. (Author)

AD-613 886 Div. 2

Lincoln Lab., Mass. Inst. of Tech., Lexington.
AN F REGION ECLIPSE.
Revised ed.,
by J. V. Evans. 21 Sep 64, 12p Rept. no. JA-2371
Contract AF19 628 500

Unclassified report

Pub. in Journal of Geophysical Research (U. S.)
v70 n1 p131-42 Jan 1 1965 (Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 7 Aug 64.

Descriptors: (*Ionosphere, Electron density), (*Solar eclipses, Ionospheric disturbances), (*Atmospheric sounding, Ionosphere), Ionization, Electrons, Ions, Temperature, Magneto-optic effect, Radar scanning, Radar echo areas.

Observations of the electron density, electron temperature, and ion temperature were made over the height range 240-750 km vertically above Millstone Radar Observatory on July 19-21, 1963. The technique employed for these measurements is the incoherent back-scatter method. The eclipse occurred on the afternoon of July 20 and caused a large rapid decrease in the electron temperature at all heights and a subsequent recovery. The ion temperature was seen to change at all heights almost equally rapidly, though by a smaller amount. These changes in temperature caused a rapid reduction in the value for the diffusive equilibrium scale height. As a consequence, ionization moved downward and the density at h sub max increased, though at altitudes above 425 km it decreased. The total electron content of the region under study was about 7 x 10 to the 12th power electrons/sq cm at the commencement of the event but had declined to about 6 x 10 to the 12th power electrons/sq cm by the time point of last contact was reached. (Author)

AD-613 889 Div. 2

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE BEHAVIOR OF f sub zero F sub 2 DURING SOLAR ECLIPSES,
Revised ed.,
by J. V. Evans. 16 Oct 64, 6p Rept. no. JA-2434
Contract AF19 628 500

Unclassified report

Pub. in Journal of Geophysical Research (U. S.)
v70 n3 p733-8 Feb 1 1965 (Copies not available to DDC or Clearinghouse customers).
Revision of manuscript submitted 31 Aug 64.

Descriptors: (*Solar eclipses, Ionospheric disturbances), (*Ionospheric disturbances, Solar eclipses), (*Atmospheric sounding, Ionosphere), Electron density, Ionization, Radar scanning, Radar echo areas, Geophysics.

Increases in f sub zero F sub 2 were observed at three widely separated stations (Anchorage, Ottawa, and Millstone) during the July 20, 1963, eclipse. At all three stations the eclipse was very close to total at F sub 1-region heights. At stations more distant from the eclipse line the effects were less pronounced or absent. An examination of some previous eclipse observations shows

that increases in f sub zero F sub 2 are rare and apparently require the eclipse to be total or very nearly so. Where this is not the case, the resulting drop in temperature would appear to be much less, and consequently electron density may simply be maintained constant for part of the eclipse. It also appears that increases are only observed at stations where the magnetic inclination is large, and this can readily be accounted for. Although the data are scanty, there does appear to be some solar cycle control of the exospheric electron temperature as postulated by Bourdeau [1964], since increases of f sub zero F sub 2 were not reported during the 1954 eclipse observed over Europe. (Author)

AD-613 893 Div. 2

Lincoln Lab., Mass. Inst. of Tech., Lexington.
RADAR OBSERVATIONS OF VENUS AT 3.6 CENTIMETERS,
by D. Karp, W. E. Morrow, Jr., and W. B. Smith.
23 Oct 64, 3p Rept. no. JA2467
Contract AF19 628 500

Unclassified report

Pub. in Icarus: International Journal of the Solar System (U. S.) v3 n5/6 p473-5 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Venus, Radio astronomy), (*Radio astronomy, Venus), Bistatic radar, Radar scanning, Superhigh frequency, X Band, Astrophysics, Extraterrestrial topography.

Radar observations of Venus at 3.6 cm have shown that the planet appears extremely 'rough' at this wavelength. Apparent reflectivity of the surface was found to be one-tenth that measured at longer wavelengths, raising the interesting possibility of absorption in the Cytherean atmosphere. (Author)

3. Chemical Warfare Equipment and Materials

No Entries

4. Chemistry

AD-613 204 Div. 4, 13
CFSTI Prices: HC$3.00 MF$0.75

Rutgers-The State Univ., New Brunswick, N. J.
REACTIONS OF CHLORINE DIOXIDE AND OTHER OXY-CHLORO COMPOUNDS WITH ORGANIC COMPOUNDS. KINETICS AND MECHANISMS OF THE REACTION BETWEEN CHLORITE AND HYPOCHLOROUS ACID IN AQUEOUS SOLUTION.
Annual progress rept. no. 3,
by M. L. Granstrom, B. M. Israel, W. B. Snow, and M. E. Lynch. Aug 64, 62p
Grants NSF G9707, DA CML18 1081G26
Unclassified report

Descriptors: (*Water supplies, Purification), (*Oxidizers, Chemical properties), (*Chlorine compounds, Dioxides), (*Chlorites, Chemical reactions), Chlorine, Chlorates, Oxychlorides, Sodium compounds, Organic compounds, Reaction kinetics, Ultraviolet spectroscopy, Thermodynamics, Heat of activation, Buffers (Chemistry).

The reaction of the formation of chlorine dioxide from hypochlorous acid and chlorite in aqueous solutions, which was studied in the present research is gHOCl + hClO2(-) yields pClOw + qClO3(-) + rCl(-). Since chlorine dioxide, chlorite and hypochlorous acid have different absorption peaks in the ultra-violet range, the spectrophotometer was used as the method of analysis. Kinetic analysis of the concentration values of hypochlorous acid, chlorine dioxide and chlorite changing with time during the course of the reaction reveals that the rate of the overall reaction is first order with respect to the two reactants under the range of experimental conditions used. The yield of chlorine dioxide from chlorite varied from 35 to 65% within the experimental conditions described. It was observed that the majority of the chlorite comsumed was oxidized to chlorine dioxide or chlorate whereas the hypochlorous acid consumed was reduced to chloride. A mechanism is suggested in which Cl2O2 is the activated intermediate complex. This mechanism suggests that the formation of the intermediate is the slow rate determining step.

AD-613 210 Div. 4

Low Temperature Lab., Univ. of California, Berkeley.
THE FREEZING POINT METHOD OF DETERMINING FREE ENERGIES IN A 2-COMPONENT SYSTEM FORMING COMPOUNDS. CONCENTRATED AQUEOUS SULFURIC ACID,
by W. F. Giauque, J. E. Kunzler, and E. W. Hornung. 25 Jun 56, 6p
Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v78 p5482-6 Nov 1956 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and ONR.

Descriptors: (*Sulfuric acid, Freezing), (*Thermochemistry, Chemical equilibrium), Chemical compounds, Water, Solutions, Hydrates, Thermodynamics, Eutectics.

A method is described in which freezing point observations may be utilized to obtain the partial molal free energies at all concentrations in a two-component liquid in equilibrium with a series of pure compounds. The method is illustrated by the determination of the variation of the free energy of water in aqueous sulfuric acid from A = 2 to A = -0.005, where A represents the water in H2SO4.AH2O. (Author)

AD-613 211 Div. 4

Low Temperature Lab., Univ. of California, Berkeley.
THE LOW TEMPERATURE HEAT CAPACITY AND ENTROPY OF SULFURIC ACID HEMIHEXAHYDRATE. SOME OBSERVATIONS ON SULFURIC ACID 'OCTAHYDRATE',
by E. W. Hornung, T. E. Brackett, and W. F. Giauque. 22 Jun 56, 6p
Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v78 p5747-51 Nov 20 1956 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and ONR.

Descriptors: (*Sulfuric acid, Hydrates), Entropy, Melting, Heat of fusion, Eutectics, Low-temperature research.

Sulfuric acid has been shown, both by chemical and thermodynamic analysis, to have a hemihexahydrate, H2SO4.6.5H2O. The heat capacity of H2SO4.6.5H2O has been determined from 15 to 320K. The ice-hemihexahydrate eutectic temperature is 211.28K. The peritectic between H2SO4.4H2O, H2SO4.6.5H2O and equilibrium solution occurs at 219.53K. Hulzmann and Biltz (Z. anorg. allgem. Chem., 218:369 (1934)) interpreted the lower of two fixed points in the aqueous sulfuric acid system as the eutectic between ice and 'octahydrate', the upper as the 'octahydrate'-'hexahydrate' peritectic. The present work shows that the 'lower fixed point' is actually two fixed points 0.43 apart. These are interpreted as the ice-'octahydrate' eutectic at 200.60K, and a peritectic between 'octahydrate', tetrahydrate and equilibrium solution at 201.03K. No one has ever analyzed a solid phase of composition H2SO4.8H2O. Attempts to obtain this pure phase for analysis were unsuccessful, nor could it be cooled to low temperatures without inducing spontaneous transformation. The best evidence that the solid phase is 'sulfuric acid octahydrate' is that the melting curve, extrapolated into the unstable region above the peritectic, appears to have zero slope near that composition.

AD-613 228 Div. 4

Lincoln Lab., Mass. Inst. of Tech., Lexington.
RARE EARTH NICKEL OXIDES,
by Aaron Wold, Benjamin Post, and Ephraim Banks. 17 Apr 57, 3p
Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v79 p4911-3 Sep 20 1957 (Copies not available to DDC or Clearinghouse customers)
Prepared in cooperation with Polytechnic Inst. of Brooklyn, N. Y.

Descriptors: (*Rare earth compounds, Nickelates), (*Nickelates, Crystal structure), X-ray diffraction analysis, Transition elements, Oxides, Lanthanum compounds, Neodymium compounds, Samarium compounds, Gadolinium compounds, Yttrium compounds, Preparation, Chemical analysis, Tables, Geometric forms.

LaNiO3, containing nickel in the trivalent state was prepared and its structure studied by X-ray diffraction methods. The dimensions of the rhombohedral pseudo-cell are a = 7.676±0.002 A., alpha = 90 degrees 43 minutes. The dimensions of the primitive rhombohedral cell are alpha sub p = 60 degrees 49 minutes, a = 5.461 A. The hexagonal form of this cell has the following dimensions: a = 5.456 A., c = 13.122 A. Neodymium oxide reacts with nickel (II)

oxide, in the presence of sodium carbonate, to form a single phase whose composition may vary between Nd 1.67Ni(+2) 0.72Ni(+3) 0.41 03.84 and Nd 1.75Ni(+2) 0.57 Ni(+3) 0.43 03.84. An increase in the ratio Nd:Ni results in the formation of more trivalent nickel. With the exception of one very weak line at 2 theta = 31. 2 degrees, all the lines of the X-ray diffraction patterns out to 2 theta = 75 degrees could be indexed satisfactorily on the basis of a monoclinic unit cell with a = 3.92 A., b = 6.16 A., c = 3.77 A. and beta = 92.4 degrees. Samarium, gadolinium and yttrium oxides do not appear to form stable compounds with nickel (II) oxide under the conditions used to form the other rare earth nickel oxides. The product of reaction between lanthanum oxide, samarium oxide and nickel (II) oxide, in the mole ratio 1:1.4, was a new phase which seemed to be isomorphous with the phase obtained from the reaction of mixtures having compositions between 2Ni0.1.5Nd203 and 2Ni0.1.75Nd203.

AD-613 229 Div. 4, 2

Washington Univ., Seattle.
INTENSITY AND LINE-WIDTH OF THE 15-MICRON CO2 BAND, DETERMINED BY A CURVE-OF-GROWTH METHOD,
by David F. Eggers, Jr. and Lewis D. Kaplan.
21 Nov 56, 8p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v25 n5 p876-83 Nov 1956 (Copies not available to DDC or Clearinghouse customers).
Supported by ONR and NSF.

Descriptors: (*Carbon dioxide, Absorption spectrum), (*Absorption spectrum, Carbon dioxide), (*Line spectrum, Carbon dioxide), Band spectrum, Infrared spectroscopy, Numerical analysis.

AD-613 230 Div. 4

Chemical Lab., Northwestern Univ., Evanston, Ill.
RADIATION CHEMISTRY OF POLYETHYLENE. V. HYDROGEN ISOTOPE EXCHANGE STUDIES,
by Malcolm Dole and Francis Cracco.
12 May 61, 10p
Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v66 p193-201 Feb 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by AEC, NSF, and ARPA.

Descriptors: (*Polyethylene plastics, Radiochemistry), (*Radiochemistry, Polyethylene plastics), Hydrogen, Deuterium, Exchange reactions, Gamma rays, Cobalt, Radioactivity, Free radicals, Reaction kinetics, Low-temperature research.

After irradiation in vacuo with Co-60 gamma-rays at liquid nitrogen temperature, Marlex-50 polyethylene was exposed to deuterium gas at room temperature. Considerable D-H exchange occurred, and the exchange was studied as a function of deuterium pressure, exchange cell volume, irradiation dose, and time of initiating the exchange after irradiation. Kinetic equations have been derived for three cases: constant free radical concentration, first-order free radical decay and second-order free radical decay. The data agree best with the first-order decay equations; the decay constant and duration of exchange agree to an order of magnitude with estimates from the e.s.r. work of Lawton, Balwit and Powell. The D2-free radical reaction rate constant is about 1000-fold faster than calculated for a gas phase reaction between D2 and RCHR', but close to that for the D2 and CH3CH2 reaction. The exchange, as expected, does not continue until isotopic exchange equilibrium has been established. The total observable number of D-H exchanges was estimated to be between 1 and 2-fold the number of free radical sites initially present. For reasons given in the paper the exchange probably involves hydrogen atoms close to the free radical or on the nearest neighbor sites, and provides a new mechanism for free radical migration in the solid polyethylene. (Author)

AD-613 240 Div. 4

Washington Univ., Seattle.
ACID-BASE CATALYSIS IN CONCENTRATED ACID SOLUTION. DEUTERIUM ISOTOPE EFFECTS IN THE DECARBONYLATION OF AROMATIC ALDEHYDES,
by W. M. Shubert and Howard Burkett. 16 May 55, 5p
Grant NSF G757
Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v78 p64-8 1956 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Aldehydes, Sulfuric acid), (*Sulfuric acid, Aldehydes), Deuterated compounds, Catalysis, Aromatic compounds, Reaction kinetics.

Isotope effects have been determined for (1) the decarbonylation of mesitaldehyde vs. deuteromesitaldehyde (MesCDO) in 60 to 100% sulfuric acid, and (2) the decarbonylation of mesitaldehyde in 60 to 100% sulfuric vs. deuterosulfuric acid. The observed isotope effects are not explained by a termolecular mechanism. With certain reasonable assumptions, a bimolecular mechanism of successive proton transfer steps, equations 2 and 3, is consistent with the isotope effects. All previous observations are explainable on the basis of the bimolecular mechanism, including (1) the shapes of the plots of k(obsd) vs. % sulfuric acid for 2,4,6-trimethyl-, triethyl- and triisopropylbenzaldehyde, and (2) the fact that for the mesitaldehyde decarbonylation, the change in k(obsd) with sulfuric acid percentage is in apparent agreement with the unimolecular mechanism, 4, over part of the acid range. (Author)

AD-613 245 Div. 4

Florida State Univ., Tallahassee.
THE POTENTIOMETRIC MEASUREMENT OF ACID DISSOCIATION CONSTANTS AND pH IN THE SYSTEM METHANOL-WATER. pKa VALUES FOR CARBOXYLIC ACIDS AND ANILINIUM IONS,
by A. L. Bacarella, Ernest Grunwald, H. P. Marshall, and E. Lee Purlee. 24 Jan 55, 16p
Contract Nonr98802; Grant NSF G1086, Proj. NR055 330
Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v20 n6 p747-62 Jun 1955 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Acids, Dissociation), (*Carboxylic acids, Dissociation), (*Organic nitrogen compounds, Dissociation), (*Alcohols, Water), (*PH, Measurement), Aromatic compounds, Electrolytic cells, Solvents, Electrolytes.

Thermodynamic pKa values were measured for formic, acetic, propionic, butyric, and benzoic acid and for anilinium, N-methylanilinium, and N-dimethylanilinium ion in methanol-water solvents containing 0, 20,

40, 60, 80, and 95 volume-percent methanol. The pKa values were measured by means of the cell: glass electrode/ H+, Cl-, other solutes/AgCl-Ag, using a Beckman Model G or Model GS pH meter and a simple adaptation of the differential potentiometric procedure which is of very general applicability. The measurement of pH by means of the cell: hydrogen or glass electrode/solution X/KCl(sat.)/Hg2Cl2-Hg or AgCl-Ag was reinvestigated. The theories of Planck and of Henderson lead to nearly equivalent expressions for the junction e.m.f. at the boundary: solution X/KCl(sat.). The expression: pH = (F/RT) (E - A - B log cl), derived on this basis, differs from the usual expression for pH by a term proportional to log cl, cl being the equivalent concentration of electrolyte in solution X. According to the theory, A and B are independent of the nature of the solute in solution X. The use of this new expression greatly improves the accuracy of the measured pH values.

AD-613 246 Div. 4

Florida State Univ., Tallahassee.
A REVERSIBLE SILVER-SILVER CHLORIDE ELECTRODE FOR 95% (VOLUME) METHANOL-WATER SOLUTIONS,
by E. Lee Purlee and Ernest Grunwald.
23 May 55, 2p
Grant NSF G1086

Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v59 p1112-3 Oct 1955 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Electrodes, Silver), (*Silver compounds, Chlorides), (*Alcohols, Water), Electrolytic cells, Voltage, Electrolytes, Solutions, Glass.

In the course of recent e.m.f. measurements with the cell glass electrode/H+, Cl-, other solutes, 95% (vol.) methanol/AgCl-Ag (1) thermal silver-silver chloride electrodes prepared by the method of Anderson were observed to perform rather sluggishly and to require relatively long periods of time for equilibration, especially after exposure to dilute solutions of mixed electrolytes, e.g., sodium chloride-sodium benzoate mixtures. E* is defined as the reference e.m.f. of the silver-silver chloride electrode at 25.0, i.e. E* = E + 0.05915 log CHCC1Y2 where E = measured e.m.f. in volts, CH(CC1) = stoichiometric hydrogen (chloride) concn., y = mean ionic activity coefficient. The equation -log y = 1.638 mu 1/2/(1 + 2.426 mu 1/2) is employed to obtain activity coefficients. Although values of E* differ for individual glass electrodes, E* has been found to remain satisfactorily constant (±0.2 mv.) and reproducible for a given glass electrode at the ionic strengths employed (up to ca. 0.025M).

AD-613 255 Div. 4, 25

Stanford Univ., Calif.
PROTON MAGNETIC RESONANCE SPECTRA OF SOME ALKYL NITRITES,
by Lawrence H. Piette, James D. Ray, and Richard A. Ogg, Jr. 19 Dec 56, 3p

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v26 n5 p1341-2 May 1957 (Copies not available to DDC or Clearinghouse customers).
Sponsored by Office of Ordnance Research, U. S. Army, and supported in part by National Science Foundation.

Descriptors: (*Organic nitrogen compounds, Nuclear magnetic resonance), (*Nitrites, Nuclear magnetic resonance), (*Nuclear magnetic resonance, Nitrites), Molecular isomerism, Absorption spectrum, Protons, Chemical bonds.

The proton resonance spectra of methyl, ethyl, and n-propyl nitrites was studied at room temperature and at their freezing points. A doubling of the alkyl group resonances was found at the freezing temperatures and was attributed to a cis-trans molecular rotation.

AD-613 269 Div. 4
CFSTI Prices: HC$0.50 MF$0.50

Naval Research Lab., Washington, D. C.
INVESTIGATION OF FATTY ACID MONOLAYERS ON METALS BY CONTACT POTENTIAL MEASUREMENTS. Interim rept.,
by C. O. Timmons and W. A. Zisman. 10 Feb 65, 15p
Rept. no. NRL-6208
Proj. RR001 01 43 4751

Unclassified report

Descriptors: (*Monomolecular films, Fatty acids), (*Fatty acids, Adsorption), (*Metals, Monomolecular films), Platinum, Nickel compounds, Oxides, Voltage, Surface tension, Chemisorption, Separation.

Each of the homologous series of pure n-fatty acids from formic to hexacosanoic was studied as a condensed monomolecular layer adsorbed on Pt and NiO substrates. Both the stearic and nonadecanoic acids were also studied on various polished metal surfaces including Fe, Cr, Cu, Au, W, Mo, Ag, Nb, Al, Cd, Mg, Sn, Pb, Be, Zn, and Ni. The change in contact potential difference (Delta V) between the metal and an aged reference electrode was measured in air at 23C and 50% R.H. Surface packing in each monolayer was characterized by the methylene iodide contact angle (theta). Systematic and reproducible values of Delta V and theta were found for each member of the homologous series. Values of theta for stearic acid varied with the nature of the metal substrate, and the results were in reasonable accord with the lattice spacing of the substrate atoms. Values of Delta V for stearic acid monolayers varied from a maximum of 0.365 volt on W to -0.095 volt on Pb, and it was concluded that the perpendicular component of the dipole moment of the adsorbed acid molecule was a function of the specific interaction of metal substrate and the acid carboxylic group. Stearic acid desorbed readily from Pt but not from NiO, and it was concluded that chemisorption had occurred on the NiO. (Author)

AD-613 299 Div. 4, 25
CFSTI Prices: HC$1.00 MF$0.50

Battelle Memorial Inst., Columbus, Ohio.
MEASUREMENT OF TRUE SURFACE AREA IN ELECTRODES.
Quarterly technical progress rept. no. 1, 15 Dec 64-15 Mar 65,
by J. McCallum, J. F. Walling, and C. L. Faust.
2 Apr 65, 22p BATT-7138-Q-1
Contract AF33 615 2225

Unclassified report

Descriptors: (*Surface area, Electrodes), (*Electrodes, Surface area), (*Porous metals, Surface area), Electrochemistry, Capacitance, Capillaries, Porosity, Geometry, Measuring devices (Electrical and electronic).

The objective of this program is to understand and develop an electrochemical method for determining surface areas in porous electrodes. Initial work will be concerned with trying to understand measurements on single uniform pores, capillaries. In this report

three possible approaches to area measurement are discussed. Double-layer capacitance is selected for initial study but the effects of diffusion, adsorption, and filming will be kept in mind for possible independent checks of true surface area in porous electrodes. Geometric effects on capacitance are investigated briefly, both theoretically and experimentally. The theoretical prediction is that double-layer capacitance in porous electrodes may be treated as flat-plate capacitors, providing the radii of the small pores are larger than about 100 A. Pertinent experimental techniques are reviewed. The use of fast response pulses appears to hold the most promise for successful estimation of true surface area. (Author)

AD-613 305 Div. 4, 14, 20
CFSTI Prices: HC$2.00 MF$0.50

California Univ., Los Angeles.
CHEMISTRY OF POSITIVE IONS. I. GENERAL THEORY PARTICULARLY FOR THE RADIATION INDUCED CROSS LINKAGE OF POLYMERS AND POLYMERIZATION OF SATURATED HYDROCARBONS,
by W. F. Libby. 1961, 30p
Contract AF49 638 901
AFOSR 563

Unclassified report

Descriptors: (*Radiation chemistry, Ions), (*Ions, Radiation chemistry), (*Polymers, Radiation chemistry), (*Hydrocarbons, Polymerization), (*Polyethylene plastics, Radiation chemistry), Free radicals, Theory, Aliphatic compounds, Reaction kinetics, Ionization potentials, Thermochemistry, Decomposition, Heat of activation, Chemical bonds, Phase studies.

The chemical properties of positive ions are considered to be analogous to those of the corresponding neutral atom or molecule except that the charge strengthens bonds and provides the long ranged attractive polarization force which causes the reaction cross sections to be very large. For organic ions dehydrogenation to form carbonium ions occurs frequently so in addition to the parent ion radical with its great reactivity as a type of super fluorine atom the carbonium ions with their extremely acidic (electrophilic) properties cause a wholly different set of reactions analogous to those of carbene and leading to the prediction of radiation induced polymerization of saturated aliphatic hydrocarbons. Both ion radicals and carbonium ions can play important roles in the radiation induced cross linkage of polyethylene and other polymers. It is predicted that the effect of phase will be very important in radiation chemistry because the cage effect of the surrounding close packed molecules in the liquid and solid phase as contrasted with the gas phase will cause the fragmentation of the parent ions which is so marked in the gas phase to be reversed to a considerable extent and promote the formation of large molecules, particularly polymers. (Author)

AD-613 312 Div. 4
CFSTI Prices: HC$1.00 MF$0.50

Minnesota Univ., Minneapolis. School of Chemistry.
OXYMERCURATION OF CIS AND TRANS-2-BUTENE,
by Maurice M. Kreevoy and Larry L. Schaleger.
1960, 19p
Contract AF49 638 711
AFOSR 863

Unclassified report

Descriptors: (*Metalorganic compounds, Mercury compounds), (*Mercury compounds, Metalorganic compounds), (*Butanols, Synthesis (Chemistry)), Alkenes, Stereochemistry, Chemical equilibrium, Reaction kinetics, Chlorine compounds, Iodine compounds, Thermochemistry, Decomposition, Polarization.

Equilibrium constants were measured for the reaction of cis and trans-2-butene with aqueous mercuric chloride to give three and erythro-3-chloromercuri-2-butanol. The three compound is thermodynamically more stable by 0.4 kcal./mole in aqueous solution. This was construed to require that the chloromercuri group and the hydroxyl group prefer a gauche orientation in solution. The deoxymercuration of three and erythro-3-iodomercuri-2-butanols by non-halogen acids proceed at nearly identical rates. They give the starting olefine without cross-contamination. This is interpreted in terms polarization of the terminal methyl groups. (Author)

AD-613 403 Div. 4

Low Temperature Lab., Univ. of California, Berkeley.
THE HEAT CAPACITIES AND ENTROPIES OF SULFURIC ACID TRI-AND TETRAHYDRATES,
by E. W. Hornung and W. F. Giauque. 4 Feb 55, 6p
Grant NSF G1194

Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v77 p2983-7 Jun 5, 1955 (Copies not available to DDC or Clearinghouse customers)
See also AD-613 211.

Descriptors: (*Sulfuric acid, Hydrates), Entropy, Fleat of fusion, Heat of formation, Melting, Chemical equilibrium, Low-temperature research, Thermodynamics, Crystal structure, Experimental data, Specific heat.

The heat capacities of sulfuric acid tri- and tetrahydrates have been measured from 15 to 300K. The heats of fusion are 5736 and 7322 cal/mole at their respective melting points, 236.77 and 244.89K The peritectic temperature, where the trihydrate is in equilibrium with tetrahydrate and solution, was found to be 236.72K. The unstable melting point was estimated to be 0.05 above this temperature. The values of the entropies at 298.16K, are 82.55 cal/deg. mole for the trihydrate and 99.07 cal/deg. mole for the tetrahydrate. The entropies of formation of these two hydrates have been calculated from isothermal data and the values agree closely with those obtained by means of the third law of thermodynamics. This indicates that there is no residual disorder due to hydrogen bonding or other effects at limiting low temperatures. It has been shown that sulfuric acid tetrahydrate crystallizes as $H_2SO_4(4.0000 \pm 0.0001)H_2O$. (Author)

AD-613 404 Div. 4

Low Temperature Lab., Univ. of California, Berkeley.
THE SPONTANEOUS TRANSFORMATION FROM MACROCRYSTALLINE TO MICROCRYSTALLINE PHASES AT LOW TEMPERATURES. THE HEAT CAPACITY OF $MgSO_4.6H_2O$,
by W. P. Cox, E. W. Hornung, and W. F. Giauque.
7 Mar 55, 5p
Grant NSF G1194

Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v77 p3935-8 Aug 5 1955 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Phase studies, Hydrates), (*Hydrates,

Phase studies), (*Magnesium compounds, Sulfates), Entropy, Crystal structure, Theromodynamics, Low-temperature research, Experimental data, Specific heat.

The heat capacity of MgSO46H2O was measured from 15 to 325K. Assuming crystal perfection at 0K, the entropy at 298.16K, was found to be 83.20 cal/deg./mole. A table of thermodynamic properties from 0 to 320K, is presented. These results were obtained when the sample was not allowed to stand near 120K, for more than a short period. When MgSO46H2O is allowed to stand in the region near 120K, heat is slowly evolved. Heat capacity measurements starting at 15K., on sample thus treated, disclosed no anomaly near 120 and absorption of heat over a broad region with a maximum near 246K. Nitrogen gas absorption near 77K, showed that the evolution of heat was accompanied by the formation of microscopic phase regions. Barieau, Chu and Giauque had found that ZnSO4.6H2O behaves in an almost identical manner. The two crystals are isomorphous. Zinc sulfate hexahydrate has been reported by Copeland and Short to be unstable with respect to the reaction 6(ZuSO46H2O) = 5(ZnSO4.7H2O) + ZnSO4H2O below 21.5. Thus the most plausible explanation of the anomalous heat effects in both the zinc and magnesium hexahydrates is to assume their decomposition into other hydrates, a process so difficult in the solid state that only microcrystalline phase regions can be formed. (Author)

AD-613 406 Div. 4

Cobb Chemical Lab., Univ. of Virginia, Charlottesville.
THE EFFECT OF CONFIGURATION ON THE REACTIVITY OF THE CHALCONE SYSTEM,
by Robert E. Lutz and James O. Weiss. 1 Nov 54, 6p
Grant NSF G440

Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v77 p1814-8 Apr 5 1955 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ketones, Stereochemistry), (*Stereochemistry, Ketones), (*Grignard reagents, Chemical reactions), Hydrogen peroxide, Metalorganic compounds, Magnesium compounds, Bromides, Lithium compounds, Aluminum compounds, Sodium compounds, Borohydrides, Hydrides, Reduction (Chemistry), Molecular isomerism.

Phenylmagnesium bromide adds largely 1,4 to both cis- and trans-chalcones. Phenyllithium, which adds largely 1,2 to the trans isomer, adds chiefly 1,4 to the cis. Both isomers are reduced exclusively 1,2 at the carbonyl groups by aluminum isopropoxide and sodium borohydride, the trans isomer more easily than the cis; and both isomers are reduced 1,2 by lithium aluminum hydride. trans-Benzalacetomesitylene is not reduced by aluminum isopropoxide or sodium borohydride but is reduced 1,4 by lithium aluminum hydride. These results are interpreted in terms of greater steric interferences in cis-chalcone, especially at the carbonyl carbon. (Author)

AD-613 407 Div. 4

Cobb Chemical Lab., Univ. of Virginia, Charlottesville.
THE ACTION OF LITHIUM ALUMINUM HYDRIDE AND PHENYLLITHIUM ON PHENYLATED CHALCONES,
by Robert E. Lutz and Everett H. Rinker, Jr.
12 Aug 54, 5p
Grant NSF G440

Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v77 p366-9 Jan 20 1955 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ketones, Stereochemistry), (*Stereo chemistry, Ketones), (*Grignard reagents, Chemical reactions), (*Lithium compounds, Chemical reactions), Aluminum compounds, Hydrides, Aluminates, Reduction (Chemistry), Metalorganic compounds, Molecular isomerism.

Aluminum isopropoxide in normal fashion reduces the carbonyl of trans- but not of cis-alpha-phenylchalcone; lithium aluminum hydride reduces the carbonyls of both, and also the carbonyl of alpha, beta-diphenylchalcone. Phenyllithium adds 48% 1,2 and 33% 1,4 to the trans isomer but chiefly 1,4 to the cis; and it adds only 1,2 to the carbonyl of alpha-beta-diphenylchalcone. These results are shown to fit a consistent pattern. (Author)

AD-613 408 Div. 4

Cobb Chemical Lab., Univ. of Virginia, Charlottesville.
SYNTHESIS AND REACTIONS OF 1,1,2-TRIBENZOYLETHYLENE AND RELATED COMPOUNDS,
by Chi-Kang Dien and Robert E. Lutz. 15 Oct 55, 7p
Grant NSF G440

Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v78 p1987-92 May 1956 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ketones, Chemical properties), O-Heterocyclic compounds, Oxidation, Alkenes, Reduction (Chemistry), Chlorination, Bromination, Spectra (Visible and ultraviolet), Chemical bonds, Molecular isomerism, Synthesis (Chemistry), Chemical reactions.

1,1,2-Tribenzoylethylene was prepared from 3-benzoyl-2,5-diphenylfuran by nitric acid oxidation. It is reduced to the saturated triketone or to the furan, and undergoes typical addition-cyclizations to the chloro and acetoxy furans. In the additions of hydrogen halide and morpholine, the halide and morpholinyl groups go to the 2-position as shown by subsequent furanizations of the addition compounds and oxidations of the furans to the chloro and morpholinyl unsaturated triketones. Chlorinations of both the saturated and unsaturated triketones appear to be straightforward. Bromination of 1,1,2-tribenzoylethane is at the 1-position but is followed by facile rearrangement to the 2-bromo compound. Bromination of the unsaturated triketone involves reduction of the 1-bromine of the dibromide and furanization. Prohibitive steric hindrance to halogenation in the 1-position of 1,2-tribenzoylethane is offered by a previously substituted halogen in the 2-position. (Author)

AD-613 409 Div. 4

Cobb Chemical Lab., Univ. of Virginia, Charlottesville.
ALPHA-SUBSTITUTED BETA-DIKETONES. STEREOISOMERIC ENOLS OF ALPHA-PHENACYLDIBENZOYLMETHANE. ADDITION-ENOLIZATION OF UNSATURATED TRIKETONES,
by Robert E. Lutz and Chi-Kang Dien. 6 Feb 56, 11p
Grant NSF G440

Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v21 p551-60 May 1956 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ketones, Stereochemistry), (*Stereochemistry, Ketones), Alkenes, Alcohols, Copper compounds, Complex compounds, Chemical bonds, Molecular isomerism, Spectra (Visible and ultraviolet), Chemical reactions, Stability.

The persistence and instability of metastable alpha-substituted beta-diketones are attributed to steric effects. The existence of two stereoisomeric alpha-phenacyldibenzoylmethane enols was demonstrated. One (cis, crystalline) was obtained by enolization of the triketone and gave a normal chelated copper derivative. The other (trans, oil) was obtained by conjugate reduction of tribenzoylethylene which followed a predicted sterochemical course, and gave a non-chelated complex copper salt involving four molecules of enol. Steric factors affecting the ease of furanization of the trans enol and its 3-bromo derivative are discussed. Reversible addition-enolization of tribenzoylethylene by alkoxide ion was demonstrated, and the effect of acid on competing ketonization and elimination is discussed. Trans-dibenzoylethylene is shown to undergo reversible base-catalyzed addition of alcohol under similar conditions. (Author)

AD-613 410 Div. 4

Cobb Chemical Lab., Univ. of Virginia, Charlottesville.
STEREOISOMERIC UNSATURATED TRIAROYLETHYLENES. REDUCTIVE-FURANIZATION AND CIS-ADDITION-FURANIZATION,
by Chi-Kang Dien and Robert E. Lutz. 9 Jul 56, 19p
Grant NSF G440

Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v21 p1492-1509 Dec 1956 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ketones, Stereochemistry), (*Stereochemistry, Ketones), (*O-heterocyclic compounds, Synthesis (Chemistry)), Bromine compounds, Chemical equilibrium, Catalysis, Molecular isomerism, Reduction (Chemistry), Chemical bonds, Spectra (Visible and ultraviolet), Complex compounds.

Cis and trans 1-p-bromobenzoyl-1,2-dibenzoylethylenes were prepared by oxidation of the corresponding furans. Equilibration by the action of sunlight and by sunlight-iodine catalysis showed the trans to be the more stable isomer. Reactions, and the preparation of related compounds including saturated triketones and furans are described. A variety of reductions were carried out but none followed a consistent stereochemical course. In one case the cis enol was produced; in another furans. Reductive-furanizations were caused by zinc acetic acid-acetic anhydride and by catalytic hydrogen, and the study of the possible intermediates showed that a trans enol must have been involved as the point at which the original cis-trans difference disappeared and cyclization occurred. The mechanism is discussed. Acid-catalyzed addition-furanization by acetic anhydride and by acetyl chloride took consistent cis-stereochemical courses, to the appropriate structurally-isomeric furans. The postulated mechanism involves primary protonation of the cis 1-aroyl oxygen with retention of configuration at the ethylene double bond through the point of ring closure. (Author)

AD-613 441 Div. 4

Reed Coll., Portland, Oreg.
THE ATOMIC WEIGHTS OF FLUORINE AND SILVER,
by Arthur F. Scott and William Ware. 30 Jan 57, 5p
Contract Nonr71600

Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v79 p4253-7 Aug 20 1957 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Silver, Atomic properties), (*Fluorine, Atomic properties), Chemical analysis, Test method.

This is the first chemical determination of the atomic weight of fluorine by the Harvard method. Perfluorobutyryl chloride was prepared by the reaction between PC15 and carefully fractionated perfluorobutyric acid. The chloride was purified by fractional distillation in vacuum systems. Samples of the chloride were hydrolyzed in pyridine solution and the chloride was precipitated with a known amount of silver. The end-point was determined nephelometrically, the final adjustment being made after the precipitate had stood for two years. The atomic weight of fluorine is calculated to be 18.999 as the average result of six analyses. This new value is shown to be in excellent agreement with the best atomic weight values derivable from mass-spectrographic measurements and from nuclear reaction data. The question of unifying the chemical and physical atomic weight scales by assigning the value 19 to the mass of the anisotopic element F is discussed. (Author)

AD-613 448 Div. 4, 12
CFSTI Prices: HC$3.00 MF$0.75

Research Inst., Temple Univ., Philadelphia, Pa.
ADDITION AND SUBSTITUTION PRODUCTS OF OXYGEN FLUORIDES.
Annual progress rept. no. 5, 1 Jan-31 Dec 64,
by A. G. Streng and A. V. Grosse. 5 Jan 65, 55p
Contract Nonr308501

Unclassified report

Descriptors: (*Oxyfluorides, Synthesis (Chemistry)), (*Helium group gases, Fluorides), Physical properties, Paramagnetic resonance, Chemical analysis, Absorption spectrum, Oxidizers, Rocket propellants, Igniters.

Experiments on preparation of new oxygen fluorides with the content of oxygen higher than in the previously prepared O(x)F(y) compounds were made. Compounds with the average elementary composition of O(4.7)F(2.0), O(4.9)F(2.0) and O(6.0)F(2.0) were obtained. The method of preparation of O(4)F(2) has been improved and the following properties of tetraoxygen difluoride determined: melting point, 82 ± 2K.; normal boiling point, 194K.; vapor pressure, log P sub mm. = 5.9-585/T; thermal stability; solubility in liquid nitrogen, oxygen and Freons; molar extinction coefficients in the visible range and E.P.R. spectrum. A method of chemical analysis of O4F2 is given. New data on characterization of oxygen fluorides have been obtained. Molar extinction coefficients and E.P.R. spectrum of OF2 have been determined and a comparison of the thermal stability, vapor pressure and the absorption and E.P.R. spectra of all the oxygen fluorides is given. Reaction of oxygen difluoride with xenon at room temperature and ordinary pressure leading to XeF2 was discovered and is described.

AD-613 450 Div. 4, 25
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PERTURBATION OF THE THERMAL EQUILIBRIUM DISTRIBUTION IN THERMAL DISSOCIATION OF DIATOMIC MOLECULES,
by E. E. Nikitin. 24 Mar 65, 17p FTD-TT-64-468
TT 65-61941

Unclassified report

Unedited rough draft trans. of Zhurnal Fizicheskoi

Khimii (USSR) 1959, v. 33, no. 3, p. 572-580.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Diatomic molecules, Dissociation), (*Dissociation, Thermochemistry), (*Thermochemistry, Diatomic molecules), Pyrolysis, Chemical equilibrium, Perturbation theory, Harmonic oscillators, Probability, Statistical distributions, Special functions (Mathematical), Kinetic theory, USSR.

For a harmonic oscillator with a finite number of discrete levels the decomposition rate constant depends upon the probability of transition of the oscillator in the discrete spectrum P-n,n±1 and upon the probability of transition to the continuous spectrum P-infinity. In actual cases when P-infinity is sufficiently large in comparison with P-10 the rate of decomposition is determined by the rate of delivery of low energy level molecules to the dissociation threshold. The maximum value of the preexponential factor is here of the order of the number of collisions. The distribution function for decomposing oscillators for periods greater than the time of relaxation of the vibration energy 1/k-o decreases exponentially. With increase in energy it decreases more rapidly than the Boltzman function exp (-E/kT), tending to zero for the last discrete level, when the decomposition rate constant, depending upon P-10 and P-infinity, attains its maximum value. The fraction of molecules decomposing in the time t approx.=1/k-o, which were initially at a lower temperature, is less than the ratio between the time of relaxation and the characteristic time of reaction. The remaining molecules decompose according to an exponential law with the characteristic time 1/k. (Author)

AD-613 455 Div. 4
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF PRODUCING NITRIC ACID,
by E. A. Kazakova, N. S. Trifonova, and I. M. Zelichenok. 22 Mar 65, 5p FTD-TT-64-1194
TT 65-61946

Unclassified report

Unedited rough draft trans. of Russian patent 161701, appl. 785821/23-4, 6 Jul 62.

Descriptors: (*Nitric acid, Production), Adsorption, Steam, Silicon compounds, Dioxides, Gels, Vacuum, Separation, Vapors, USSR.

The object of the invention is a method of obtaining nitric acid from a gaseous mixture, which contains nitrogen oxide, oxygen and other gases by the method of cooling the mixture and passing it through an adsorber with fluidized layers of absorbent, for example, silica gel, which is distinguished by the fact that, for the purpose of lowering the cost and simplifying the technological process, steam is passed into the absorbent and separated out by desorption under a vacuum at a temperature of 80 to 120C with the blowing through by air nitric acid in the vapor phase. For the purpose of intensifying the process, the adsorption and synthesis are accomplished under pressure up to 10 kg/sq. cm. (Author)

AD-613 484 Div. 4
CFSTI Prices: HC$1.00 MF$0.50

Stanford Univ., Calif.
TRACER EXPERIMENTS WITH OZONE AS OXIDIZING AGENT IN AQUEOUS SOLUTION,
by James H. Espenson and Henry Taube.
11 Jan 65, 23p Technical rept. no. TR-2
Contract Nonr22563, Proj. NR052 443

Unclassified report

Descriptors: (*Ozone, Oxidation), (*Sulfur compounds, Dioxides), (*Oxidation-reduction reactions, Ozone), Acids, Solutions, Water, Tracer studies, Oxygen, Solvents, Exchange reactions, Ions, Isotopes, Bases (Chemistry), Sulfites, Sulfates, Nitrites, Nitrates, Manganates, Manganese compounds, Thallium compounds.

When ozone reacts with sulfur dioxide in aqueous acid solution, as many as two ozone-oxygens appear in each product sulfate ion. Corresponding to this excess transfer (only one O being required for the oxidation), the oxygen formed is found to have undergone exchange with the solvent. In alkaline solution, transfer in excess of one O for each sulfite ion is observed and some of the sulfate oxygen is derived from the solvent despite the fact that sulfite ion is not a labile species under these conditions. Ozone induces exchange between sulfate ion and water both in alkaline and acidic solution, but the reaction is so slow as not materially to affect the results which have been described. By contrast the isotopic course of the reaction of nitrite ion with ozone in alkaline solution is simple; the nitrate ion contains two oxygens derived from the nitrite, and one derived from the ozone. Substantial ozone-oxygen appears in the manganese dioxide and thallium (III) oxide which are formed in the reaction with ozone of Mn(++)aq. and Tl(+)aq., respectively. (Author)

AD-613 497 Div. 4, 25

Pittsburgh Univ., Pa.
ION-SOLVENT INTERACTION III, STRUCTURAL ASPECTS OF ION-SOLVENT INTERACTION IN AQUEOUS SOLUTIONS: A SUGGESTED PICTURE OF WATER STRUCTURE,
by Henry S. Frank and Wen-Yang Wen.
24 Jun 57, 9p

Unclassified report

Pub. in Faraday Society. Discussions (Gt. Brit.) n24 p133-40 1957 (Copies available only to DDC users).
Supported in part by Office or Ordnance Research and NSF.

Descriptors: (*Solvents, Molecular association), (*Water, Molecular association), (*Ions, Solutions), Entropy, Specific heat, Density, Tracer studies, Diffusion, Dielectric properties, Dipole moments, Viscosity, Chemical bonds, Ammonium compounds, Bromides.

In addition to the direct action of the ionic charge on water as a dielectric medium, ions may exert an influence on the equilibrium between the ice-like and non-ice-like forms which are present in room-temperature water. This provides a way of accounting for experimental results in a variety of areas, including entropy, heat capacity, temperature of maximum density, tracer self-diffusion, thermal conductivity, and dielectric relaxation, as well as viscosity and ionic mobility and their temperature coefficients. The tetrabutyl ammonium cation acts as a structure-promoter in the same way as do non-polar solutes, amino acids and fatty acid anions. These various effects seem explicable in a straightforward manner in terms of a new picture of water as consisting of flickering clusters of hydrogen-bonded molecules, in which the co-operative nature of cluster formation and relaxation is related to the partially covalent character which is postulated for the hydrogen bond. (Author)

AD-613 519 Div. 4, 17
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command,

Wright-Patterson AFB, Ohio.
TITANIUM AND HYDROGEN,
by Yu. V. Baimakov and O. A. Lebedev. 13 Jan 65, 18p FTD-MT-64-317
TT 65-61966

Unclassified report

Edited machine trans. of Politekhnicheskii Institut, Leningrad. Trudy (USSR) 1963, no. 223, p. 25-34.

Descriptors: (*Titanium, Impurities), (*Hydrogen, Titanium), Absorption, Heat of reaction, Reaction kinetics, Dissociation, Titanium compounds, Hydrides, Decomposition, Powder metals.

An investigation was made of the interaction of titanium with hydrogen. According to the work performed, the following conclusions can be made. Maximum content of hydrogen in powder titanium is equal to 42.96 l/100 g, and in compact titanium, 38.14 l/100g. Temperature of beginning of reaction of hydrogen is equal to 330C. Maximum saturation of titanium by hydrogen is observed in interval 300-500C. Speed of saturation by hydrogen of compact titanium is limited by diffusion. During investigation of the kinetics of dissociation of titanium, decomposition of hydride starts at a temperature of 350-380C, and maximum speed of dissociation in vacuum, depending upon conditions of experiment, was observed at 570-650C. On the basis of experiments of determination of elasticity of dissociation of titanium hydride in interval of temperatures 300-700C, it is shown that from 300C there starts desorption of hydrogen, and from 500C -dissociation of hydride. At a temperature of 25C the free energy of formation and dissociation of titanium hydride on the basis of the obtained data is equal to +10,100 cal/mole, entropy 22 cal/deg. and thermal effect 16,700 cal/mole.

AD-613 524 Div. 4

Washington Univ., Seattle.
PREPARATION AND PROPERTIES OF BISTRIFLUOROMETHYLSULFURYL PEROXIDE AND TRIFLUOROMETHYL TRIFLUOROMETHANE SULFONATE,
by Ronald E. Noftle and George H. Cady. 1965, 13p
Technical rept. no. TR-51
Contract Nonr47716, ARPA Order 26 60, Task 2

Unclassified report

Available only for reference use at DDC field Services. Copy is not available for public sale.

Descriptors: (*Organic sulfur compounds, Synthesis (Chemistry)), (*Fluorine compounds, Synthesis (Chemistry)), (*Peroxides, Synthesis (Chemistry)), Oxidizers, Explosive materials, Electrolysis, Sulfonates, Halogenated hydrocarbons, Esters, Nuclear magnetic resonance, Mass spectrum, Spectra (Infrared), Chemical reactions, Chemical properties.

Electrolysis of trifluoromethanesulfonic acid at -23C yields the unstable compound bistrifluoromethylsulfuryl peroxide which decomposes explosively to perfluoroethane, sulfur trioxide, and the ester, trifluoromethyl trifluoromethanesulfonate. (Author)

AD-613 554 Div. 4
CFSTI Prices: HC$1.00 MF$0.50

Directorate of Scientific Information Services, Ottawa (Ontario).
A METHOD FOR MEASURING POLYMER DECOMPOSITION TEMPERATURES,
by O. Ya. Fedotova and S. A. Zakoshchikov.
Mar 65, 4p Rept. no. T-420-R
TT 65-41420

Unclassified report

Trans. of Plasticheskie Massy (USSR) 1960, no. 5, p. 64-65.
Also available from NRC as C-5270.

Descriptors: (*Polymers, Decomposition), (*Decomposition, Temperature), Test methods, Measurement, USSR, Canada, Graphics, Transition temperature.

AD-613 638 Div. 4
CFSTI Prices: HC$1.00 MF$0.50

Pennsalt Chemicals Corp., Philadelphia, Pa.
HIGH PRESSURE SYNTHESIS OF NEW COMPOUNDS, BISMUTH DISELENIDE AND BISMUTH MONOSULFIDE MONOSELENIDE,
by Meyer S. Silverman. Mar 65, 7p
Technical rept. no. TR-45
Contract Nonr268700, Proj. NR356 408

Unclassified report

Descriptors: (*Bismuth compounds, Synthesis (Chemistry)), (*Sulfides, Bismuth compounds), (*Selenides, Bismuth compounds), Chalcogens, Molecular structure, Stability, Density, Pyrolysis, X-ray diffraction analysis.

To obtain an essentially quantitative yield of BiSe2, a 1:2.2 atomic ratio of Bi:Se was subjected to 45 kilobars at 1280C for 5-10 minutes. For BiSSe, a mixture of Bi:S:Se in a 1:1.1:1.1 atomic ratio was held at 47 kilobars and 1000C for 5-10 minutes. Both products are stable in water, aqueous ammonia and concentrated HCl at room temperature, but react rapidly and vigorously with concentrated HNO3. Density determinations on both crude and purified milligram samples ranged from 7.23 to 7.79 g/cc, for BiSe2, and 6.35 to 6.72 g/cc for BiSSe. These materials when heated at 5 degrees per minute in either O2 or N2 decompose, in an initial step, primarily to the corresponding trivalent bismuth compound. With BiSe2, conversion to Bi2Se3 occurred at 275C, as indicated by the X-ray diffraction powder pattern of the residue. BiSSe decomposed above 240C to a material whose X-ray diffraction powder pattern was in agreement with that of the mineral guanajuatite, Bi2(S,Se)3. Although the two compounds are not isomorphs, general agreements apparent in the X-ray diffraction patterns may indicate structural similarities. (Extracted)

AD-613 642 Div. 4, 25
CFSTI Prices: HC$2.00 MF$0.50

Air Force Materials Lab., Air Force Systems Command, Wright-Patterson AFB, Ohio.
A LOWER STANDARD ELECTRON ENERGY FOR ANALYTIC MASS SPECTROSCOPY.
Rept. for Jul-Dec 63,
by Donald J. Dunbar and L. A. Harrah. Feb 65, 44p
ML-TR-64-381
Proj. 7367, Task 736701

Unclassified report

Descriptors: (*Chemical analysis, Mass spectroscopy), (*Mass spectroscopy, Chemical analysis), Radiation chemistry, Electron bombardment, Hydrocarbons, Alkenes, Alcohols, Aromatic compounds, Ethers, Halogenated hydrocarbons, Acetates, Tables, Graphics.

Ten mass spectra from each of twelve compounds including methane, n-butane, 2-butyne, 1-butene, iso-butene,

diethyl ether, benzene, ethanol, iso-pentane, ethyl iodide, toluene and ethyl acetate were obtained using the Bendix time of flight mass spectrometer. The spectra from each compound were obtained at 15, 17, 20, 25, 30, 35, 40, 50, 70 and 100 volts electron bombarding energy. Representative ionization efficiency curves are plotted from each compound. Other spectra are discussed and recommendations made for electron bombarding energies to be used in analytic spectroscopy with the Bendix time of flight instrument. (Author)

AD-613 654 Div. 4
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
INVESTIGATIONS OF THE KINETICS OF HYDROGEN AND OXYGEN REACTIONS ON A PLATINUM ELECTRODE IN ACID SOLUTION USING PULSE AND DECAY TECHNIQUES.
Interim rept.,
by S. Schuldiner and T. B. Warner. 4 Sep 64, 17p
Rept. no. NRL-6136
Projs. SR007 12 01 0809, RR001 01 43 4754
Unclassified report

Descriptors: (*Platinum, Electrodes), (*Electrodes, Chemical reactions), (*Hydrogen, Oxidation), (*Oxygen, Electrochemistry), Anodes (Electrolytic cells), Reaction kinetics, Adsorption, Ionization, Test methods.

The influence of hydrogen partial pressure, current density, and temperature on the anodic oxidation of sorbed H and the anodic generation of sorbed O were determined. Electrode processes were evaluated and separated to give the following quantities: (a) the amount of H associated with a Pt surface and its immediate vicinity, (b) the extent to reaction of H atoms, absorbed in the metal interior, that migrate to the surface of the metal and are either ionized or react with O atoms, (c) the extent of reaction of H2 from the solution phase, (d) the amount of O adsorbed on the Pt surface, and (e) the amount of O absorbed in the Pt surface layers (skin). The kinetics of the open-circuit reaction of galvanostatically determined amounts of sorbed O with H2 were also determined.

AD-613 655 Div. 4

Frankford Arsenal, Philadelphia, Pa. Research and Development Directorate.
FRIEDEL-CRAFTS REACTION OF FERROCENE WITH ARSENIC TRICHLORIDE. SOME MONOFERROCENYL DERIVATIVES OF ARSENIC (III).
Technical research article,
by Gilbert P. Sollott and William R. Peterson, Jr.
8 Oct 64, 10p Rept. no. A65-1
Proj. 1C014501B13A
Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v30 p389-93 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Arsenic compounds, Ferrocenes), (*Friedel-crafts reaction, Ferrocenes), Metalorganic compounds, Chlorides, Iron compounds, Synthesis (Chemistry).

The reaction of ferrocene with arsenic trichloride under Friedel-Crafts conditions has been found to give only monosubstitution on arsenic. Results of efforts to optimize the yield of arsenosoferrocene thus obtained are presented. Arsenosoferrocene, formulated as a dimer, is readily converted to ferrocenyldichloroarsine, oxybis (ferrocenylchloroarsine), a polymeric arsenosoferrocene, and arsenoferrocene. The compounds described are the first known arsenic-containing ferrocene derivatives. The bis (chloroarsine) appears to be the first example of a new class of compounds of the type (RAsCl)2O. Varied behavior encountered when dimeric arsenosoferrocene is converted to the polymeric species in aqueous alkali is explained in terms of hydrolysis of the ferrocenearsonite anion. Conversion of the dimer to the polymer in various solvents is attributed to solvolysis of the arsenic-oxygen linkage. Absorptions shown by ferrocene and benzene derivatives in the region, 750-700/cm. are associated with As-O-As bridges. Ferrocene is less reactive than benzene in Friedel-Crafts reactions with acid chlorides of AsIII, although more reactive with acid chlorides of PIII. A possible explanation for this anomalous behavior is suggested. (Author)

AD-613 660 Div. 4, 25
CFSTI Prices: HC$2.00 MF$0.50

Little (Arthur D.) Inc., Cambridge, Mass.
GASEOUS METABORATES. III. THE BERYLLIUM OXIDE-BORON OXIDE SYSTEM. RESEARCH ON THERMODYNAMICS OF THE Al-B-O, Be-B-O AND Al-Be-O SYSTEMS.
Interim technical rept. no. 1,
by Paul E. Blackburn and Alfred Buchler. Mar 65, 26p
Contracts AF49 638 1171, DA19 020ORD5584,
ARPA order 315 62, ARPA Order 40-62
Unclassified report

Descriptors: (*Borates, Thermochemistry), (*Beryllium compounds, Borates), (*Boron compounds, Oxides), Mass spectrum, Phase studies, Enthalpy, Entropy, Lithium compounds, Chemical bonds, Gases, Vapor pressure.

Gaseous beryllium metaborate, Be(BO2)2, was identified mass spectrometrically in the vapor above the beryllium-boron-oxygen system. A study of this system by differential thermal analysis and Knudsen effusion using a vacuum balance and mass spectrometer, showed solid Be3B2O6 to be the only condensed mixed oxide phase present with a melting point of 1495 ± 5C. The following thermodynamic values were obtained for the formation of gaseous beryllium metaborate from beryllium oxide and gaseous boron oxide: BeO(c) + B2O3(g) = Be(BO2)2(g); enthalpy at 1500C = 22 ± 5 kcal/mole; entropy at 1500C = 6 ± 1 eu/mole. For the formation of solid Be3B2O6 from the condensed oxides: 3BeO(c) + B2O3(l) = Be3B2O6(c); enthalpy = -23 ± 5 kcal/mole; entropy = -13 ± 2 eu/mole. The metal-anion bond strengths in the gaseous lithium and beryllium metaborates show the same relation to each other as the bond strengths in the corresponding chlorides, thus further confirming the pseudohalide character of the gaseous metaborates. (Author)

AD-613 716 Div. 4, 15, 30
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
SOLVING THE CHEMICAL EQUILIBRIUM PROBLEM USING THE DECOMPOSITION PRINCIPLE,
by G. B. Dantzig and Marvin Shapiro. 10 Aug 60,
23p Rept. no. P-2056
Unclassified report

Descriptors: (*Chemical equilibrium, Linear programming), (*Linear programming, Chemical equilibrium), (*Decomposition, Chemical equilibrium), Gases, Thermochemistry, Functions, Iterative methods, Matrix algebra, Programming (Computers).

The determination of the equilibrium composition of a gaseous mixture is equivalent to the determination of the number of moles of each molecular species present that minimize the total free energy of the mixture. The convex function for free energy as given by Gibbs is minimized subject to the constraints of the mass-balance equations for the mixture. A solution to the problem is given using a version of the decomposition procedure for linear programming. A mathematical description of the method of solution as well as the computational algorithm as programmed for the IBM 704 with some results are given. (Author)

AD-613 722 Div. 4, 25

General Atomic Div., General/Dynamics Corp., San Diego, Calif.
A CROSSED BEAM INVESTIGATION OF THE N2(+)-D2 ION-MOLECULE REACTION,
by B. R. Turner, M. A. Fineman, R. F. Stebbings, and J. F. Colwell. 1964, 8p
Contract DA49 146XZ041 Unclassified report
DASA 1521

For presentation at the National Meeting of the American Chemical Society (148th), Chicago, Ill., 30 Aug-4 Sep 64.
Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Ion beams, Recombination reactions), (*Recombination reactions, Ion beams), Molecular beams, Differential cross section, Mass spectroscopy, Nitrogen, Deuterium, Ions, Molecules.

A beam of ions was crossed with a neutral beam and the angular distribution of both the primary and secondary ions was measured. The reaction N2(+) + D2 to N2D(+) + D was investigated because of its large total cross section and the confinement of secondary ions to a narrow forward cone in the laboratory system.

AD-613 737 Div. 4

Kansas Univ., Lawrence. Dept. of Chemistry.
TRIANGULAR WAVE CYCLIC VOLTAMMETRY. I,
by Z. Galus, H. Y. Lee, and Ralph N. Adams.
22 May 62, 6p
Grant AF AFOSR62 14 Unclassified report
AFOSR 65-0528

Pub. in Journal of Electroanalytical Chemistry (Netherlands) v5 p17-22 1963 (Copies available only to DDC users).

Descriptors: (*Electrochemistry, Organic compounds), (*Electrodes, Chemical reactions), (*Organic nitrogen compounds, Oxidation), Amines, Reaction kinetics, Measurement, Recording devices, Chemical analysis.

Cyclic voltammetry using moderately slow sweep rates, and hence pen and ink recording, is advantageous for examining the overall mechanisms of complex organic electrode processes. The method is particularly well suited to the study of organic oxidations at solid electrodes. When coupled with single sweep peak voltammetry for measuring charge transfer rates and other kinetics parameters, it can be a powerful tool for the study of organic electrode processes. (Author)

AD-613 753 Div. 4

Royal Coll. of Science and Technology, Glasgow (Scotland).
SOME SUBSTITUTED CYCLOPENTADIENYL DERIVATIVES OF NICKEL, COBALT, IRON, MOLYBDENUM, AND TITANIUM,
by G. R. Knox, J. D. Munro, P. L. Pauson, G. H. Smith, and W. E. Watts. 10 April 61, 6p
Contract AF61 052 321
AFOSR 2027 Unclassified report

Pub. in Chemical Society. Journal (Gt. Brit.) n904 p4619-24 Oct 1961 (Copies available only to DDC users).

Descriptors: (*Ferrocenes, Synthesis (Chemistry)), (*Metalorganic compounds, Synthesis (Chemistry)), Transition elements, Nickel compounds, Cobalt compounds, Iron compounds, Molybdenum compounds, Titanium compounds, Monocyclic compounds, Amines, Great Britain.

The applicability to other transition metals of methods developed for the synthesis of ferrocenes is demonstrated. The extension of the fulvene synthesis to aminofulvenes is described. (Author)

AD-613 774 Div. 4

Indiana Univ., Bloomington. Dept. of Chemistry.
STUDIES OF BORON-NITROGEN COMPOUNDS. IX. SYNTHESIS AND PROPERTIES OF SOME SUBSTITUTED TRIMETHYLBORANES,
by Riley Schaeffer and Lee J. Todd. 29 Jan 64, 8p
Grant DA ARO D31 124G99
AROD 3100:6 Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v87 n3 p488-94 Feb 5 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Boranes, Synthesis (Chemistry)), Azides, Amines, Dissociation, Decomposition, Nuclear magnetic resonance, Spectroscopy, Molecular weight.

Reaction of chloromethyldimethylborane with lithium azide yields azidomethyldimethylborane, which upon hydrogenation yields aminomethyldimethylborane. Molecular weight and n.m.r. spectral studies indicate that aminomethyldimethylborane exists in a monomer-polymer equilibrium. Dissociation studies with ammonia and trimethylborane suggest that monomeric aminomethyldimethylborane is a weaker Lewis acid and Lewis base than corresponding monofunctional derivatives. The acid-base character and the n.m.r. spectral study suggest that monomeric aminomethyldimethylborane may exist as a metastable three-membered ring. The reactions of chloromethyldimethylborane with water, ammonia, and 2,4,6-trimethylpyridine are described. The thermal decomposition of azidomethyldimethylborane is described. (Author)

AD-613 775 Div. 4

Michigan Univ., Ann Arbor.
DERIVATIVES OF PYROMELLITIC ACID. 1,2,4,5-TETRASUBSTITUTED CYCLOHEXANES,
by Daniel T. Longone. 10 Jan 63, 4p
Grant NSF-G-2626 Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v28 p1770-3 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Cyclohexanes, Synthesis (Chemistry)),

(*Carboxylic acids, Chemical reactions), Stereochemistry, Iodine compounds, Bromine compounds, Amides, Aromatic compounds, Catalysis.

Catalytic hydrogenation of pyromellitic acid yields one of the five possible stereoisomeric 1,2,4,5-cyclohexanetetracarboxylic acids. The latter acid was utilized as starting material for the preparation of a variety of tetrasubstituted cyclohexanes. 1,2,4,5-Tetrakis(iodomethyl)cyclohexane, precursor of 1,2,4,5-tetramethylenecyclohexane and its aromatized dimer tetramethyl (2,2) paracyclophane, was derived from pyromellitic acid in an optimum over-all yield of 62%. (Author)

AD-613 778 Div. 4

California Univ., Berkeley.
ACIDITY OF HYDROCARBONS. XI. ACTIVATION PARAMETERS FOR EXCHANGE OF TOLUENE-alpha-d WITH LITHIUM CYCLOHEXYLAMIDE IN CYCLOHEXYLAMINE,
by A. Streitwieser, Jr., R. A. Caldwell, M. R. Granger, and P. M. Laughton. 16 Apr 64, 3p
Grant AF AFOSR62 175
AFOSR 65-0455

Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v68 p2916-8 1964 (Copies not available to DDC or Clearinghouse customers).
See also AD-611 602.

Descriptors: (*Hydrocarbons, pH), (*Aromatic compounds, Exchange reactions), (*Cyclohexanes, Exchange reactions), (*Exchange reactions, Reaction kinetics), Lithium compounds, Amides, Metalorganic compounds, Catalysts, Amines, Chemical equilibrium, Thermochemistry, Heat of activation, Entropy, Solvent action.

The dependence at two temperature of the pseudo-first-order rate constants for exchange of toluene-alpha-d with cyclohexylamine on the concentration of the lithium cyclohexylamide catalyst leads to the thermodynamic parameters for the aggregation equilibrium of lithium cyclohexylamide and the activation parameters for the bimolecular exchange reaction. The equilibrium is unusual in that aggregation is accompanied by an increase in entropy; the exchange reaction itself has an unusually negative entropy of activation. These results are interpreted in terms of specific solvation effects. (Author)

AD-613 779 Div. 4

California Univ., Berkeley.
ACIDITY OF HYDROCARBONS. XII. AGGREGATION OF LITHIUM CYCLOHEXYLAMIDE IN CYCLOHEXYLAMINE BY ISOPIESTIC MEASUREMENT,
by A. Streitwieser, Jr. and W. M. Padgett, II.
16 Apr 64, 5p
Grant AF AFOSR62 175
AFOSR 65-0456

Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v68 n10 p2919-22 Oct 1964 (Copies not available to DDC or Clearinghouse customers).
See also AD-613 778.

Descriptors: (*Hydrocarbons, pH), (*Lithium compounds, Molecular association), (*Cyclohexanes, Molecular association), (*Amides, Molecular association), Catalysts, Metalorganic compounds, Amines, Molecular weight, Distillation, Vapor pressure.

Isopiestic molecular weight measurements of lithium cyclohexylamide in cyclohexylamine show a degree of aggregation in semiquantitative agreement with theories derived previously from kinetic measurements. A modified technique for such isopiestic measurements is described. (Author)

AD-613 781 Div. 4

Minnesota Univ., Minneapolis. School of Chemistry.
POLAROGRAPHY AND VOLTAMMETRY IN DIMETHYLSULFOXIDE,
by I. M. Kolthoff and T. B. Reddy. 3 Mar 61, 7p
Contract AF49 638 519
AFOSR 698

Unclassified report

Pub. in Electrochemical Society. Journal (U. S.) v108 n10 p980-5 Oct 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Sulfoxides, Organic sulfur compounds), (*Organic sulfur compounds, Solvent), (*Electrochemistry, Solvents), Polarization, Electric current, Voltage, Graphics, Physical properties, Hydrocholoric acid, Sulfuric acid, Percholoric acid, Cobalt, Nickel, Sodium, Ions.

An exploratory voltammetric study of several acids, some representative metal ions, a few quinones, and oxygen was made in the solvent dimethylsulfoxide (DMSO). Perchloric, sulfuric, and hydrochloric acids were found to be monoprotic strong acids in DMSO. Cobalt (II) and nickel (II) are reduced irreversibly at the dropping mercury electrode with large overpotentials indicating strong solvation. Polarograms of quinones showed two cathodic waves of unequal height in the absence of proton donor. The effect of proton donor on the polarograms of quinones was studied. The mechanism of the reduction of quinones in DMSO is discussed. Rotated platinum and rotated mercury pool electrodes can be used to advantage in DMSO. (Author)

AD-613 785 Div. 4, 25

Florida State Univ., Tallahasse.
SELF-ASSOCIATION CONSTANT OF CHLOROFORM FROM NMR CHEMICAL SHIFTS,
by Charles F. Jumper, Merle T. Emerson, and Bentz B. Howard. 17 Jul 61, 2p
Contract AF49 638 278
AFOSR 1214

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v35 n5 p1911-2 Nov 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Chloroform, Nuclear magnetic resonance), (*Nuclear magnetic resonance, Chloroform), Chemical bonds, Molecular association, Cyclohexanes, Carbon tetrachloride, Solvent action, Chemical equilibrium.

The self-association equilibrium constant K' for chloroform in cyclohexane was found to be 0.16±0.006/(M.F.).

AD-613 786 Div. 4

Catholic Univ. of America, Washington, D. C.
CHARACTERISTIC FUNCTIONS AND PARAMETERS IN THE THEORY OF HYDROGEN OVERPOTENTIAL. II. INTERPRETATION OF SOME MEASUREMENTS OF HYDROGEN OVERPOTENTIAL ON PALLADIUM.

Revised ed.,
by Gilbert W. Castellan. 23 Aug 60, 5p
Contract AF49 638 475
AFOSR 3290

Unclassified report

Pub. in Electrochemical Society. Journal (U. S.) v108 n3 p282-5 Mar 1961 (Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 4 Jan 60.

Descriptors: (*Hydrogen, Palladium), (*Palladium, Hydrogen), (*Voltage, Hydrogen), Electrodes, Electrochemistry, Diffusion, Ph.

The hydrogen overpotential measurements of Hoare and Schuldiner on beta-palladium in acid solutions can be interpreted quantitatively in terms of slow primary discharge of H3O+ and very rapid atom combination. In solutions in the pH range 1.5-1.8 the mechanism is influenced by a limiting diffusion current of H3O(+). (Author)

AD-613 789 Div. 4

Kansas Univ., Lawrence. Dept. of Chemistry.
SPECTROPHOTOMETRIC TITRATION OF PRIMARY ALIPHATIC AMINES,
by Yu-Lin G. Liu and Charles A. Reynolds.
9 Feb 62, 4p
Contract AF49 638 472
AFOSR 1821

Unclassified report

Pub. in Analytical Chemistry (U. S.) v34 n4 p542-4 Apr 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Amines, Volumetric analysis), Aliphatic compounds, Absorption spectrum, Spectrophotometers.

A spectrophotometric titration method for determination of primary aliphatic amines in the presence of secondary and tertiary amines and other basic substances is presented. The amine is titrated in dioxane solvent with glacial acetic acid added as catalyst and a standard solution of 2-ethylhexanal as titrant. (Author)

AD-613 796 Div. 4

Kentucky Univ. Lexington.
ADDITION OF GRIGNARD REAGENTS TO HINDERED N-SULFINYLAMINES,
by Walter T. Smith, Jr., Poo An Thio, and Michael Grasley. 31 Aug 61, 1p
Contract AF49 638 49
AFOSR 1368

Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v27 p692 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Organic sulfur compounds, Grignard reactions), (*Amines, Grignard reactions), (*Grignard reactions, Stereochemistry), Amides, Grignard reagents, Metalorganic compounds, Magnesium compounds, Bromides, Chemical bonds, Molecular structure.

A study was made of the reaction of phenylmagnesium bromide with two N-sulfinylames, each of which may be considered to possess a certain amount of hindrance around the functional group. These sulfinylamines are N-sulfinylmesidine and N-sulfinyl-t-butylamine. It was found that a 71% yield of the expected sulfinamide can be obtained from phenylmagnesium bromide and N-sulfinylmesidine. This result indicates that there is essentially no steric inhibition of the Grignard addition and therefore none of the addition of the Grignard reagent takes place at the nitrogen-sulfur bond. The reaction of phenylmagnesium bromide with N-sulfinyl-t-butylamine gave the sulfinamide in a yield of only 7% under reaction conditions which give high yields (72-92%) of sulfinamides from unhindered aliphatic N-sulfinylamines. The low yield cannot be ascribed to decomposition during the isolation procedure. (Extracted)

AD-613 831 Div. 4

Stanford Research Inst., Menlo Park, Calif.
CATHODOLUMINESCENCE OF THIN FILMS CONTAINING RARE-EARTH OXIDES,
by W. W. Hansen and R. E. Myers. 23 Dec 64, 2p
Contracts DA36 039AMC00004E, Nonr288700

Unclassified report

Pub. in Applied Physics Letters (U. S.) v6 n3 p58-9 Feb 1 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Luminescence, Rare earth compounds), (*Thin films (Storage devices), Rare earth compounds), (*Rare earth compounds, Oxides), Films, Heating, Effectiveness, Phosphorescence.

AD-613 845 Div. 4

California Univ., Berkeley.
ACIDITY OF HYDROCARBONS. XIII. SOME CONDUCTIVITY STUDIES OF LITHIUM CYCLOHEXYLAMIDE, FLUORENYL-LITHIUM, AND LITHIUM PERCHLORATE IN CYCLOHEXYLAMINE,
by A. Streitwieser, Jr., W. M. Padgett, II, and I. Schwager. 16 Apr 64, 4p
Grant AF AFOSR62 175
AFOSR 65-0457

Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v68 n10 p2922-5 Oct 1964 (Copies not available to DDC or Clearinghouse customers).
See also AD-613 779.

Descriptors: (*Hydrocarbons, pH), (*Lithium compounds, Electrical conductance), (*Cyclohexanes, Electrical conductance), Catalysts, Metalorganic compounds, Amines, Amides, Perchlorates, Fluorenes, Ions, Dissociation, Chemical bonds, Exchange reactions, Reaction kinetics.

An apparatus is described for determining conductivities in an inert atmosphere. Measurements with lithium perchlorate, lithium fluorenyl, and lithium cyclohexylamide in cyclohexylamine at 49.5C give ion-pair dissociation constants in the range 10 to the-10 to 10 to the -12 power mole/l. These results indicate that the bonds to lithium in each of these salts are about equally ionic; the results confirm the conclusions reached in previous studies of kinetics of exchange with lithium cyclohexylamide in cyclohexylamine that free ions are not significantly involved in the concentration region used. (Author)

AD-613 851 Div. 4

Pittsburgh Univ., Pa.
THE OXIDATION OF EPOXIDES BY DIMETHYL SULFOXIDE. A SIMPLE SYNTHESIS OF ALPHA-HYDROXY KETONES,

by Theodore Cohen and Tadakazu Tsuji. 10 Feb 61, 2p
Contract AF49 638 788
AFOSR 249
Unclassified report

Pub. in Journal of Organic Chemistry (U. S.) v26 p1681 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Organic oxygen compounds, Oxidation), (*Sulfoxides, Chemical reactions), (*Ketones, Synthesis (Chemistry)), Alcohols, Catalysts, Boron compounds, Fluorides, Sulfides.

It is reported that epoxides can be oxidized by dimethyl sulfoxide if catalytic quantities of boron trifluoride are present. In accord with the results obtained with halides and tosylates, the products are alpha-hydroxy ketones and dimethyl sulfide. Although the same reaction occurs in the absence of catalyst, much longer reaction periods are required and the yields are seriously reduced. A sample procedure is described. (Author)

AD-613 854 Div. 4, 25

California Univ., Berkeley.
SOLID INFRARED SPECTRA, ASSIGNMENT AND VIBRATIONAL POTENTIAL FUNCTION OF DIAZOMETHANE,
by C. Bradley Moore and George C. Pimentel.
12 Sep 63, 14p
Contract AF49 638 944
AFOSR 65-0522
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v40 n2 p342-55 Jan 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Spectra (Infrared), Methane), (*Methane, Organic nitrogen compounds), (*Molecular properties, Methane), Vibration, Thermodynamics, Distortion, Solidified gases, Molecular spectroscopy.

Infrared spectra of pure solid diazomethane and diazomethane in nitrogen or argon are given here for the molecules CH2N2, CD2N2, CHDN2, and CH2N15N. These data combined with the gas-phase spectra reported earlier provide a basis for a reassignment of the vibrational spectrum. The vibrational potential function, centrifugal distortion constants, Coriolis coupling constants, and thermodynamic functions of diazomethane have been calculated. The out-of-plane hydrogen bending force constant is found to be unusually low, 0.045x10 to the minus eleventh power erg/sq rad. This is about one-fifth of that for ethylene and about one-half of that for ketene. The observed divergence of the energy levels of the out-of-plane hydrogen bending mode shows that there must be a large positive quartic contribution to the potential function for this motion. (Author)

AD-613 855 Div. 4, 25

Kansas Univ., Lawrence. Dept. of Chemistry.
EXCHANGE INTERACTION WITH ELECTROLYTICALLY GENERATED BENZONITRILE NEGATIVE ION,
by Peter Ludwig and Ralph N. Adams. 12 Apr 62, 5p
Grant AF AFOSR62 14, Proj. 9763 37631
AFOSR 65-0529
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v37 n4 p828-30 Aug 15 1962 (Copies not available to DDC or Clearinghouse customers).
Research supported in part by the Atomic Energy Commission, Washington, D. C.

Descriptors: (*Nitriles, Exchange reactions), (*Free radicals, Exchange reactions), (*Exchange reactions, Reaction kinetics), Aromatic compounds, Electrolysis, Ions, Nuclear magnetic resonance, Absorption spectrum, Line spectrum, Paramagnetic resonance.

Benzonitrile negative ion prepared by the in situ electrolytic generation technique shows strong exchange interaction with the parent benzonitrile. In dimethylformamide as solvent system, the EPR spectrum varies between the expected 54-line pattern and a single narrow line depending on the benzonitrile concentration. A bimolecular rate constant of approx. 10 to the 8th power liters/mole/sec can be estimated. (Author)

AD-613 856 Div. 4, 25, 20

Kansas Univ., Lawrence. Dept. of Chemistry.
EFFECT OF METAL IONS OF NUCLEAR HYPERFINE COUPLING CONSTANTS IN EPR SPECTRA,
by Toyokichi Kitagawa, Thomas Layloff, and Ralph N. Adams. 10 Jan 64, 4p
Grant AF AFOSR62 14
AFOSR 65-0526
Unclassified report

Pub. in Analytical Chemistry (U. S.) v36 n4 p925-6 Apr 1964.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Aromatic compounds, Molecular spectroscopy), (*Molecular spectroscopy, Metals), (*Metals, Ions), (*Hyperfine structure, Aromatic compounds), Paramagnetic resonance, Electrons, Nuclear spectroscopy, Nitrobenzenes.

The effects of metal ions on the nuclear hyperfine coupling constants of the electron paramagnetic resonance (EPR) spectra of a variety of anions of aromatic nitro compounds were investigated. The anion radical of p-chloro-nitrobenzene was selected as a model system since its EPR spectrum consists of three well resolved triplets resulting from interaction of the unpaired electron with the N14 nucleus, two equivalent (ortho) protons and two more equivalent (meta) protons. The radical anions were generated electrochemically in dimethylformamide (DMF) containing the metal ions to be investigated as supporting electrolytes. The effect of the metal ion on the N14 coupling constant was investigated.

AD-613 859 Div. 4

California Univ., Berkeley.
OUT-OF-PLANE CH2 BENDING POTENTIAL FUNCTIONS OF DIAZOMETHANE, KETENE, AND RELATED MOLECULES,
by C. Bradley Moore and George C. Pimentel.
4 Nov 63, 6p
Contract AF49 638 944
AFOSR 65-0519
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v40 n6 p1529-34 Mar 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ketenes, Chemical bonds), (*Organic nitrogen compounds, Chemical bonds), Molecular structure, Harmonic oscillators, Potential theory, Atomic orbitals, Ammonia, Alkenes, Amides.

The unusually low out-of-plane CH2 bending potential constants of ketene and diazomethane are discussed in terms of a valence bond comparison of their electronic structures to those of ethylene and ammonia. The anharmonic energy levels of the CH2 out-of-plane bending in diazomethane are fitted with an harmonicquartic potential function. A model is developed in which potential constants are transferred from the ethylene and ammonia molecules to the two valence-bond structures usually considered for the ketene and diazomethane molecules. The unusually high intensities of the bending overtones are found to be a necessary consequence of this treatment. A further experimental test may be found in the expected large change in dipole moment with vibrational state. The model provides a basis for understanding the potential functions of ketene and diazomethane, and for making qualitative predictions about other molecules such as cyanamide and CF2N2. (Author)

AD-613 862 Div. 4, 25

California Univ., Berkeley.
INFRARED SPECTRA OF CARBON MONOXIDE IN AN ARGON MATRIX,
by George E. Leroi, George E. Ewing, and George C. Pimentel. 30 Dec 63, 6p
Contract AF49 638 944
AFOSR 65-0518

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v40 n8 p2298-2303 Apr 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Carbon compounds, Monoxides), (*Spectra (Infrared), Carbon compounds), (*Argon, Cryogenics), Molecular spectroscopy, Solidified gases, Crystal lattices.

The infrared absorption spectrum of carbon monoxide in an argon matrix shows prominent bands at 2148.8 and 2138.0 1/cm with half-widths, respectively, 1.5 1/cm and 3.5 1/cm. The relative intensities of these bands are extremely dependent upon a variety of experimental conditions, including sample concentration, window temperature, and deposition rates. The variability shows that CO isolated in argon absorbs at 2148.8 1/cm and that it does not rotate. The lower frequency absorption is due to aggregates. The frequency shift of the argon-isolated CO absorption relative to that of gaseous CO shows that carbon monoxide fits tightly in the argon lattice. In contrast, the CO aggregates absorb at lower frequency than gaseous carbon monoxide. Isotopic studies using 13C16O reveal vibrational coupling of 1.1 1/cm between isotopically identical molecules in an aggregate. An increase in matrix cavity diameter would be needed if a stationary CO molecule begins to rotate in argon. This 'site expansion,' which could be as much as 0.4 A, may be an important factor inhibiting rotation. (Author)

AD-613 866 Div. 4, 25

Washington State Univ., Pullman.
ADSORPTION OF GASES ACTIVATED BY ELECTRON IMPACT,
by H. F. Winters, D. E. Horne, and E. E. Donaldson.
5 Jun 64, 8p
Grant AF AFOSR62 86
AFOSR 65-0531

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v41 n9 p2766-72 Nov 1 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Pumping (Electronics), Gases), (*Adsorption, Gases), (*Gases, Electron bombardment), Excitation, Dissociation, Probability, Nitrogen, Argon, Nickel.

Adsorption of nitrogen which has been activated by electron impact is shown to result from dissociation of the nitrogen molecule and from the interaction of energetic ions with a nickel surface. Excitation of N2 to states at about 10.3, 12.2, and 14.0 eV causes dissociation. Dissociative ionization at 24.5 eV also leads to additional pumping. Energetic N2(+)ions have an adsorption probability of approximately 0.85 when they collide with a nickel surface. It is shown that the ion adsorption probability is practically independent of energy between 30 and 100 eV. It is also shown that thermal energy ions have a very low adsorption probability. These results lead to the postulate that the N2(+) ions dissociate in impact and that the atomic nitrogen is subsequently adsorbed. Results have also been obtained which indicate that the adsorption probability of Ar(+) is strongly dependent on surface structure. Annealing of the surface greatly reduces the adsorption probability. (Author)

AD-613 867 Div. 4, 25

Kansas Univ., Lawrence. Dept. of Chemistry.
X-RAY STUDY OF CRITICAL OPALESCENCE OF POLYSTYRENE IN CYCLOHEXANE,
by B. Chu. 24 Aug 64, 5p
AROD 4089:2

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v42 n1 p426-9 Jan 1 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Styrene plastics, Cyclohexanes), (*X-rays, Scattering), (*X-ray diffraction analysis, Styrene plastics), Reflection.

The small-angle x-ray scattering of polystyrene in cyclohexane has been investigated at the critical concentration over a range of temperatures near the phase-separation temperature in the one-phase region. A composite light and x-ray scattering curve was constructed by extending small-angle x-ray measurements down to a scattering angle of 0.0005 rad with CuK alpha radiation. The angular distribution of the scattering was analyzed in terms of the Debye theory of critical opalescence and was found to be consistent with the results obtained from visible-light scattering studies. (Author)

AD-613 868 Div. 4, 25

Air Force Cambridge Research Labs., Bedford, Mass.
ION DISSOCIATION IN THE DRIFT TUBE OF A TIME-OF-FLIGHT MASS SPECTROMETER; SPURIOUS FRAGMENTS ARISING FROM CHARGE-TRANSFER AND DISSOCIATION REACTIONS OF RETARDED IONS,
by W. W. Hunt, Jr. and K. E. McGee. 1 Jun 64, 13p
AFCRL 65-140, PSRP-84
Proj. 8605

Unclassified report

Pub. in Journal of Chemical Physics (U.S.) v41 n9 p2709-13 Nov 1 1964
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Ion exchange, Mass spectroscopy), (*Mass spectroscopy, Ion exchange), Dissociation, Ionization, Reaction kinetics, Chemical reactions, Spectrum analyzers.

Spurious fragment peaks that simulate fragment-ion

dissociation products formed in the drift-tube reaction region have been observed in a time-of-flight mass spectrometer adapted for kinetic studies of ion dissociation processes. These peaks arise from processes occurring after the reactant ion has passed through the reaction region and entered the potential barrier that is normally used to separate reactants and products by selectively shifting their flight times. The flight-time shifts characteristic of such spurious peaks depend on the distance from the ion source to the potential barrier, whereas the shifts characteristic of normal fragment peaks are independent of this distance. Comparisons of experimentally measured flight-time shifts with analytically calculated values identify a fragment peak observed in association with the N2(+) mass-28 peak in N2O as a spurious fragment peak, which represents not dissociation products of N2(+) formed in the reaction zone, but neutrals formed inside the potential barrier. The absence of other fragment peaks then establishes that the neutrals are formed by the charge-transfer process N2(+) + N2O yields N2(O) + (N2O)+. Since such spurious fragment peaks can, as in this case, be much larger than any real fragment peaks present, a cautious approach to peak identification is essential when using the TOF-potential barrier technique for ion dissociation studies. The recognition of such spurious fragment peaks is greatly facilitated by making flight-time shift measurements at more than one value of the distance from the ion source to the potential barrier. (Author)

AD-613 873 Div. 4

Walter Reed Army Inst. of Research, Washington, D. C.
COULOMETRIC GENERATION OF ETHYLENE GLYCOL BIS-(BETA-AMINOETHYL ETHER)-N, N'-TETRAACETIC ACID. TITRATION OF CALCIUM IN THE PRESENCE OF MAGNESIUM,
by Gary D. Christian, Edward C. Knoblock, and William C. Purdy. 1964, 4p
Unclassified report

Pub. in Analytical Chemistry (U. S.) v37 n2 p292-4 Feb 1965 (Copies not available to DDC or Clearinghouse customers).
Research done in cooperation with Maryland Univ., College Park, Md.

Descriptors: (*Calcium, Volumetric analysis), (*Mercury compounds, Complex compounds), (*Ethers, Synthesis (Chemistry)), (*Complex compounds, Chemical precipitation), Chemical indicators, Ethylenedinitrilo tetraacetates, Glycols, Impurities, Magnesium, Electrochemistry.

Schmid and Reilley described a new complexon for the titration of calcium in the presence of magnesium. The reagent is ethylene glycol bis-beta-aminoethyl ether)-N,N'-tetraacetic acid (EGTA), an ether analog of EDTA. Reilley and Porterfield developed a coulometric method for generating EDTA from mercury EDTA at a mercury-pool cathode. By varying the pH, they were able to titrate calcium, copper, zinc, or lead. A potentiometric end point was employed with a mercury indicator electrode. A coulometric generation of EGTA was developed utilizing the same principle employed in the generation of EDTA. It was adapted to the titration of microgram quantities of calcium. The presence of magnesium interferes with the potentiometric endpoint detection. Therefore, a magnesium buffered electrolyte was employed to titrate calcium in the presence of magnesium. (Extracted)

AD-613 910 Div. 4, 3

Army Chemical Research and Development Labs., Edgewood Arsenal, Md.
REACTIONS OF ISOPROPYL METHYLPHOSPHONOFLUORIDATE WITH SUBSTITUTED PHENOLS. I,
by Joseph Epstein, Robert E. Plapinger, Harry O. Michel, James R. Cable, and Ralph A. Stephani.
Mar 65, 16p Special pub. no. CRDL-SP-3-20
Proj. 1C622401A095, Task 1C622401A09501
Unclassified report

Pub. in American Chemical Society. Journal (U. S.) v86 p3075-84 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*G agents, Chemical reactions), (*Organic phosphorus compounds, Chemical reactions), (*Phenols, Chemical reactions), Ions, Stereochemistry, Chemical bonds, Fluorides, Mathematical models, Reaction kinetics, Thermochemistry, Chemical analysis, Sarin.

A study was made of the reactivity of isopropyl methylphosphonofluoridate (GB) with various substituted phenols. The data indicate that: (1) the nucleophilic displacement capability of a phenolate increases with the basicity of the anion; (2) cationic sites in the phenol increase the reactivity of the phenolate, and the increase is inversely related to the distance between cationic and anionic sites; (3) marked steric (bulk) effects due to ortho constituents lower the reactivity of the phenol; (4) substances in the ortho position capable of hydrogen bonding can markedly increase the rate constant; and (5) the reactivity of phenols in which the ortho constituent contains a cationic site is based on the fact that effects (2) and (3) are operative. A mathematical relationship to predict the reactivity of phenols containing cationic sites is offered, and 'abnormal' reactivities by cationic and other phenols are explained. (Author)

5. Communications

AD-613 302 Div. 5, 8
CFSTI Prices: HC$1.00 MF$0.50

IIT Research Inst., Chicago, Ill.
CONTINUOUS FACSIMILE SCANNER EMPLOYING FIBER OPTICS.
Quarterly rept. no. 1, 24 Jun-31 Oct 64,
by Donald A. Pontarelli. 30 Oct 64, 7p
Rept. no. IITRI-A6093-3
Contract DA28 043AMC00164E, Proj. A6093,
Task 1P6 20501A448 02 03

Unclassified report

Descriptors: (*Facsimile equipment, Fiber optics), (*Fiber optics, Facsimile equipment), Surface properties, Brightness, Scanning.

Studies of optical and mechanical configurations towards design and placement of a fiber optics scanner within the confines of AN/GXC-5 Facsimile transmitter. Considerations relative to employment of major numbers of mechanical and electrical components now in use in the facsimile transmitter. Investigation and experimentations are being pursued to provide a higher surface brightness, above that obtained by use of large area fluorescent tubes, in the new fiber optics scanner. (Author)

AD-613 363 Div. 5, 8
CFSTI Prices: HC$2.00 MF$0.50

Naval Ordnance Lab., Corona, Calif.
TAPE-RECORDER SKEW COMPENSATION DURING PLAYBACK,
by F. K. Bickford and D. A. Schriner. 5 Mar 65,
34p Rept. no. NOLC-619

Unclassified report

Descriptors: (*Magnetic recording systems, Electronic equipment), Performance (Engineering), Design, Distortion, Magnetic tape, Corrections, Delay lines.

Typical characteristics of tape-recorder skew at low tape speeds are described, and the effect of skew on the correlation of signals from separate tracks is discussed. Specifications for a skew-correction device are obtained from measured data and used as design criteria. A prototype skew corrector was constructed, and block diagrams of its circuits are presented and discussed. It is shown that skew variations can be corrected to ±0.5 mu s at tape speeds as low as 7.5 inches per second. (Author)

AD-613 557 Div. 5, 28
CFSTI Prices: HC$1.00 MF$0.50

Rome Air Development Center, Griffiss AFB, N. Y.
THE INTENSITY-TIME RELATIONSHIP FOR FORM IDENTIFICATION.
Final technical rept.,
by Richard C. Sturtevant. Feb 65, 20p
RADC-TR-65-16
Proj. 8501, Task 850101

Unclassified report

Descriptors: (*Command and control systems, Display systems), (*Visual perception, Factor analysis), (*Target recognition, Factor analysis), (*Geometric forms, Identification), Time, Intensity, Psychophysiology, Thresholds (Physiology), Vision, Detection.

The purpose of the experiment was to determine the effect of exposure time and intensity on a form identification response such as might be encountered in a military Command and Control display situation. A conventional psychophysical method was used to determine the applicability of the Bunsen-Roscoe Law (Intensity x Time = a Constant up to a critical duration; and Intensity = a Constant above a critical duration). Exposure time thresholds were found for three subjects for each of five geometric forms at each of five intensities ranging in value from .005 to 1 foot-lambert. It was found that the Bunsen-Roscoe Law did not hold, but that time was a more important factor than intensity in identifying the forms. The results are discussed in terms of detection vs identification of stimuli, and implications for Command and Control display requirements are pointed out. (Author)

AD-613 583 Div. 5, 8, 12
CFSTI Prices: HC$3.00 MF$0.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
STUDY OF AN ORBITING DIPOLE BELT COMMUNICATION SYSTEM,
by F. Belvin and T. J. Goblick, Jr. 22 Dec 64, 82p
Technical rept. no. TR-369
Contract AF19 628 500
ESD TDR-64-591

Unclassified report

Descriptors: (*Communication satellites (Passive), Dipole antennas), (*Global communication systems, Communication satellites (Passive)), (*Dipole antennas, Communication satellites (Passive)), X band, Copper, Rods, Orbital trajectories, Multipath transmission, Military requirements, Systems engineering, Radio communication systems.

The design of communication systems utilizing orbiting dipole belts is complicated by the great amount of interaction among the various design parameters involved. This interaction makes difficult a general treatment of the design problem for such systems, necessitating the study of specific examples. This report studies in detail the simplest example of such a system in which a single equatorial dipole belt is used. An altitude of 8000 miles is used to provide satisfactory earth coverage. This altitude precludes the possibility of a limited orbital lifetime belt. An 800-kg payload of X-band, copper dipoles would provide modest data rates which should suffice for certain military needs. Insofar as a specific belt configuration and dipole design were chosen, the specific results of this work do not apply to dipole belt systems in general. However, the considerations that receive attention, and the approach used in dealing with them, can be used as a guide in the design of any dipole belt communication system. (Author)

AD-613 635 Div. 5, 15
CFSTI Prices: HC$1.00 MF$0.50

Electronic Systems Div., Air Force Systems Command, Bedford, Mass.
SOME NOTES ON CONSTRUCTION AND APPLICATION OF POISSON OPERATING CHARACTERISTIC FUNCTIONS FOR EQUIPMENT MTBF DECISION-MAKING,
by George H. Allen. Mar 65, 18p
ESD TR-65-194

Unclassified report

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Descriptors: (*Command and control systems, Reliability), (*Failure (Mechanics), Probability),

(*Decision making, Acceptability), Quality control, Systems engineering, Maintainability, Life expectancy, Functions, Mathematical models, Electronic equipment, Scheduling, Time, Costs.

During 1963 - 1964 period, the ESD Reliability/ Maintainability staff conducted a series of lectures and briefings on R/M. Several lectures dealt with equipment MTBF demonstration problems. This TDR summarizes a discussion conducted on the applications of the Cummulative Poisson Function to MTBF demonstration. The ideas produced during this and subsequent discussions are reflected in AD-611 577. (Author)

AD-613 703 Div. 5, 8
CFSTI Prices: HC$5.00 MF$1.25

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
INVESTIGATIONS OF ADVANCED ANALOG COMMUNICATIONS TECHNIQUES.
Final rept. for Dec 63-Dec 64,
by Harold D. Becker, John G. Lawton, and Ting T. Chang. Mar 65, 185p Rept. no. CAL-CM-1895-S-1
Contract AF30 602 3317, Proj. 4519, Task 451903
RADC TR-65-81 Unclassified report

Descriptors: (*Communication systems, Analog systems), Signals, Frequency modulation, Least squares method, Optimization, Phase modulation, Phase-locked comunication systems, Demodulation, Special functions, Radio frequency filters, Radio receivers, Analog computers, Simulation, Integral equations, Demodulators.

This report presents the results, obtained by analytical investigations and by computer simulation, of studies of advanced techniques upon which the design of improved analog communication systems may be based. It includes the derivation of the optimal operations to be performed in the least mean-square error estimation of the modulation function in an FM communications system. Relationships between phase-locked loop demodulation and maximum-likelihood estimation of angle-modulated signals are developed. It is shown that a physically realizable phase-locked loop followed by an infinite-delay linear filter can perform the operations specified for the infinite-delay maximum likelihood estimator. Phase-locked loop demodulators for both PM and FM modulated signals are analyzed by the quasi-linearization technique. It is shown that analog computer simulation of phase-locked loop demodulators based on low frequency equivalent circuits, which contain a sinusoidal nonlinearity, is a practical means for the investigation of such nonlinear systems. The improvement in system performance which may be attained by simultaneous use of pre-transmission and post-detection filtering is examined. (Author)

6. Detection

AD-613 348 Div. 6, 12
CFSTI Prices: HC$1.00 MF$0.50

Space and Information Systems Div., North American Aviation, Inc., Downey, Calif.
OPTICAL OBSERVANCE OF FAINT SATELLITES.
Final rept.,
by G. A. McCue, D. F. Bender, J. G. Williams, and A. S. Leonard. Jul 64, 17p Rept. no. SID-64-1490
Contract AF19 604 8427, Proj. 1770, Task 17701
ESD TDR-65-155

Unclassified report

Descriptors: (*Space surveillance systems, Optical tracking), (*Optical tracking, Satellites (Artificial)), (*Satellites (Artificial), Optical tracking), Orbital trajectories, Position finding, Data processing systems, Programming (Computers).

Significant accomplishments under this study are summarized and enumerated. Direct operational support of the Space Detection and Tracking System (SPADATS) by a group of volunteer observers, the Western Satellite Research Network (WSRN), was the most important achievement resulting from this contract. Technical groundwork that will permit the future direct support of SPADATS by WSRN is described. (Author)

AD-613 456 Div. 6, 2
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INTO THE DEPTHS OF SPACE.
22 Mar 65, 6p FTD-TT-64-1208
TT 65-61947

Unclassified report

Unedited rough draft trans. from Vyshka (USSR) 1964, 20 Jun, p. 4.

Descriptors: (*Telescopes, Astronomy), Design, Operation, Images, USSR.

A description is given of an astronomical telescope.

AD-613 551 Div. 6
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
AIRCRAFT ASPECT SOLUTION IN DYNAMIC RADAR AREA MEASUREMENTS.
Interim rept.,
by I. D. Olin. 10 Feb 65, 14p Rept. no. NRL-6194
Proj. RR008 01 41 5552

Unclassified report

Descriptors: (*Radar tracking, Aircraft), (*Radar echo areas, Measurement), Radar targets, Aspect ratio, Flight, Dynamics, Statistical analysis.

The radar cross section of a target varies with the aspect angle of the radar beam relative to the target. Among the problems in radar cross-section measurement of fullsize aircraft in flight is the difficulty associated with correlating the actual measured values with the aircraft aspect angles. Since the only aspect information available from the radar consists of target locations in spherical coordinates, a solution is desired from these data alone. By imposing restrictive conditions on the aircraft flight courses, target-oriented coordinates may be specified. When these are then combined with the radar beam position, the desired solution is established. (Author)

AD-613 664 Div. 6, 8
CFSTI Prices: HC$3.00 MF$0.75

Raytheon Co., Wayland, Mass. Advanced Development Lab.
INVESTIGATION OF PHASED ARRAY TECHNIQUES.
Final rept. for Mar 62-Dec 64,
by Herbert L. Groginsky and Robert C. Distler.
Feb 65, 69p
Contract AF19 628 361, Proj. 4600, Task 460006
AFCRL 65-151

Unclassified report

Descriptors: (*Radar tracking, Phased arrays), (*Phased arrays, Radar antennas), Phase control devices, Analog systems, Acoustics, Ultrasonic radiation, Water, Optics, Display systems, Transducers, Bandwidth, Delay lines, Radar scanning, Multiple operation.

This report describes a new technique for phasing a receiving antenna array. The method uses an acoustic analog of the antenna array to rebroadcast ultrasonic pressure waves in a transparent liquid medium (water). The contents of the medium are read out with a set of coherent optics. The readout mechanism contains a display which permits the bearing angle, radial velocity and time of occurrence of any target within the coverage region of the antenna array to be obtained. The system permits any number of these to be read out simultaneously, with no further adjustments or variation within the phasing mechanism. This report discusses the operation of the system, the limitations relevant to systems applications, the experimental verification of its basic principles, and a prognosis of the feasibility of extrapolating these techniques to large scale systems. (Author)

7. Electrical Equipment

AD-613 187 Div. 7, 25
CFSTI Prices: HC$4.00 MF$1.00

Harshaw Chemical Co., Cleveland, Ohio.
INVESTIGATION OF CdS THIN-FILM SOLAR CELLS.
Rept. for Nov 63-Dec 64.
Feb 65, 122p
Contract AF33 615 1248, Proj. 8173, Task 817301
APL TR-65-1

Unclassified report

See also AD-605 425.

Descriptors: (*Semiconducting films, Solar cells), (*Solar cells, Films), (*Cadmium compounds, Sulfides), Energy conversion, Plating, Copper compounds, Chlorides, Vapor plating, Vacuum apparatus, Silicon compounds, Monoxides, Degradation, Surface properties, Radiation damage, Effectiveness, Environmental tests, Molybdenum, Quartz, Tantalum, Silicon, Calcium compounds, Fluorides, Titanium, Nickel alloys, Iron alloys, Single crystals.

Research and development of front wall, thin film, flexible, light weight CdS solar cells was continued and decided improvements have been accomplished. A one square foot array shows a power to weight ratio of about 35.0 watts/lb. with an overall area utilization factor of over 0.80. A new chemical barrier formation process was developed providing higher cell efficiences. Exposure of cells to electron, proton and Cobalt 60 radiation show little or no damage. Studies on the formation of the CdS layer indicate a higher degree of preferred orientation and crystallite size as the substrate temperature increases. Crystallites of 100 micron dimension were observed. Optical measurements on the p-layer confirm the conclusion that the barrier layer is a highly conducting copper sulfide. Overlayers of SiO deposited on the cell decrease the rate of water vapor degradation, but mechanical imperfections restrict the thickness of the deposited layer. Theoretical analysis of the experimental data show serious and probably insurmountable problems with application of either a surface state or trap model for the CdS solar cell. (Author)

AD-613 358 Div. 7, 25
CFSTI Prices: HC$2.75 MF$1.00

Naval Research Lab., Washington, D. C.
DIRECT ENERGY CONVERSION LITERATURE ABSTRACTS.
Bibliography no. 8.
Dec 64, 139p

Unclassified report

See also AD-601 224.

Descriptors: (*Energy conversion, Bibliographies), (*Bibliographies, Energy conversion), Abstracting, Thermoelectricity, Thermionic emission, Photoelectric effect, Electrochemistry, Magnetohydrodynamics, Energy.

A collection of references from various sources covering the current literature on thermoelectricity, thermionic emission, photoelectric processes, magnetohydrodynamics, electrochemical processes, energy storage, and energy sources. (Author)

AD-613 387 Div. 7, 25

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
ALTERNATING-CURRENT GENERATION WITH MOVING CONDUCTING FLUIDS,
by H. A. Haus. 30 Nov 61, 12p

Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n7 p2161-72 Jul 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Generators, Alternating current), (*Plasma medium, Generators), Plasma oscillations, Mathematical analysis, Electromagnetic waves, Magnetohydrodynamics, Conductivity, Coils.

A one-dimensional, small-amplitude analysis is presented of alternating-current generation by a stationary electromagnetic circuit coupling to waves in a moving, perfectly conducting fluid. In a uniform applied dc magnetic field the waves in the fluid are either compressional waves if the time-average velocity v is transverse to the dc magnetic field, or Alfven waves if it is along the dc magnetic field. It is shown that, for velocities v greater than the velocity of propagation c of the compressional or Alfven waves, self-excited oscillations may be produced in a resistively loaded coil coupling to the fluid. In a traveling-wave circuit and in a resistively loaded distributed circuit coupling to the fluid, growing waves are found which result from a transformation of the fluid energy into electromagnetic energy. There is a close analogy between these power-generation mechanisms and those employed in microwave electron-beam tubes. The results of two- and three-dimensional analyses are summarized in order to show that the phenomena predicted by the simplified one-dimensional analysis occur in less idealized geometries. Possible applications are briefly discussed with reference to ac power generation by using combustion gases or a flow of a high-temperature plasma. (Author)

AD-613 888 Div. 7

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE FUEL-OPTIMAL SINGULAR CONTROL OF NONLINEAR SECOND-ORDER SYSTEMS,
Revised ed.,
by M. Athans and M. D. Canon. 15 Jul 64, 11p
Rept. no. JA2415
Contract AF19 628 500

Unclassified report

Pub. in I E E E Transactions on Automatic Control (U. S.) vAC-9 n4 p360-70 Oct 1964 (Copies not available to DDC or Clearinghouse customers).
Revision of manuscript submitted 5 Nov 63.

Descriptors: (*Fuels, Control systems), (*Control systems, Fuels), Optimization, Costs, Time, Mathematical analysis, Feedback, Nonlinear systems, Optimization, Fluid flow, Graphics, Trajectories.

The optimum control has been obtained as a function of the state of a nonlinear second-order system with the cost being a linear combination of the elapsed time and of the consumed fuel. It has been shown that if the time is of little importance, singular controls are optimal, but if the time is weighted heavily, singular controls cannot be optimal. Techniques for the determination of the various switch curves have been given. (Author)

AD-613 911 Div. 7, 25

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
MAGNETOCALORIC POWER.
Revised ed.,
by E. L. Resler, Jr. and R. E. Rosensweig. 11 May 64, 5p

Unclassified report

Pub. in AIAA Journal (U. S.) v2 n8 p1418-22 Aug 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 19 Nov 63.

Descriptors: (*Energy conversion, Thermodynamic cycles), (*Power supplies, Heat engines), (*Heat engines, Power supplies), Magnetic fields, Ferromagnetic materials, Thermodynamics, Plasma physics, Performance (Engineering).

The work treats the subject of power produced by cycling a ferromagnetic material thermally through a range of temperatures such that its magnetization changes appreciably and of utilizing the change of magnetization and its interaction with a magnetic field. Thermodynamically, an appropriate cycle to make this form of power practical is evaluated, physical circumstances to realize the cycle are discussed, and losses are estimated. In taking a broader view than previous work, it is found that potentially competitive heat engines based on magnetocaloric devices are possible, provided that the primary heat energy is first converted into mechanical form and that a regenerative cycle is used. (Author)

8. Electronics and Electronic Equipment

AD-613 169 Div. 8
CFSTI Prices: HC$1.00 MF$0.50

Army Electronics Command, Fort Monmouth, N. J.
DEVELOPMENT OF THE ESM-171 X-BAND COAXIAL MAGNETRON,
by Edward J. Kaiser. Jan 65, 25p
Technical rept. ECOM-2550
Proj. 1P6 2201A055 0418

Unclassified report

Descriptors: (*Magnetrons, X-band), Anodes (Electron tubes), Microwave equipment, Resonators, Couplings, Design, Model tests, Performance (Engineering).

This report reviews the work accomplished under an internal program at these Laboratories to develop the ESM-171 low-power, X-band coaxial magnetron. The objective of the program was to develop a magnetron capable of a peak power output of 100 watts, tunable over a frequency range of 8500- to -9600 Mc, and capable of 20-to-30% efficiency. This report describes the design approach for the ESM-171 magnetron, reviews a number of problems encountered in building the test models (poor efficiency and mode instability), and presents data obtained on the test models. (Author)

AD-613 172 Div. 8, 5
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF TRANSMITTING AND RECEIVING TIME-PULSED TELEMETERING INFORMATION,
by V. A. Khvoles. 18 Mar 65, 5p
FTD-TT-64-1082
TT 65-61860

Unclassified report

Unedited rough draft trans. of Russian patent 153492, appl. 735978/26, 26 Jun 61.

Descriptors: (*Telemeter systems, Pulse communication systems), (*Pulse communication systems, Telemeter systems), Time-lay theory, Communication theory, USSR.

A method of transmitting and receiving time-pulsed telemetering information is characterized by the fact, that for the purpose of reducing the probability of distorting information by interferences, it is transmitted into the communications channel twice: directly and after delaying by time comparison of the accepted information and the information delayed by this interval of time.

AD-613 188 Div. 8, 26
CFSTI Prices: HC$2.00 MF$0.50

Bliley Electric Co., Erie, Pa.
PRODUCTION ENGINEERING MEASURE, CR-(XM45)/U QUARTZ CRYSTAL UNITS (RUGGEDIZED, LOW-FREQUENCY).
Quarterly progress rept. no. 9, 1 Jun-30 Nov 64,
by J. M. Wolfskill, A. R. Krespan and Robert Mouck.
30 Nov 64, 28p
Contract DA36 039SC86719

Unclassified report

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See also AD-601 950.

Descriptors: (*Quartz resonators, Manufacturing methods), Performance (Engineering), Low frequency, Vibration, Quartz, Specifications, Tests, Stability.

The CR-(XM-45)/U quartz crystal units are in the 90-Kc to 200-Kc frequency range. They are similar to the military-type CR-42A/U units of specification MIL-C-3098, but are required to withstand severe vibration: 10 to 2,000 cps vibration at 15-g acceleration. These units, as developed, use 'double-rotated X-cut' resonators (dimensions and orientation similar to wide-plate NT's, but with full electrodes to excite length-width modes; the crystals are mounted by double sets of headed wires in a shock-resistant, ceramic-frame mounting. They are sealed in vacuum, in HC-13/U holders. The CR-(XM-45)/U was to provide improved temperature-frequency stability, lower resistance, and greatly improved ability to withstand severe vibration, as compared to the CR-42A units. However, it was found that the design features necessary for ruggedization imposed definite penalties: capacitance and resistance limitations had to be relaxed, and the temperature-frequency stability had to be returned to the regular CR-42A level.

AD-613 191 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

Field Emission Corp., McMinnville, Oreg.
DEVELOPMENT OF A MILLIMETER WAVE GENERATOR USING A FIELD EMISSION CATHODE.
Final rept. for 1 Nov 62-30 Apr 64,
by J. P. Barbour and F. M. Charbonnier. Feb 65, 39p
Contract AF30 602 2872, Proj. 5573, Task 557303
RADC TDR64 475

Unclassified report

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See also: AD-417 279.

Descriptors: (*Microwave oscillators, X band), (*Electron guns, Cathodes (Electron tubes)), (*Klystons, Field emission), (*Cathodes (Electron tubes), Field emission), Millimeter waves, Generators, Feasibility studies, Tungsten, Zirconium, Coatings, Electron beams, Magnetic properties, Cavity resonators, Waveguide windows, Lenses.

A feasibility study is reported for the development of electron guns with field emission cathodes, and of the application of these guns to microwave and millimeter wave oscillators. Experimental data were obtained with both coated and uncoated tungsten emitters, and also with several electron gun configurations. Data were obtained at both X-band (10 gigacycles) and at 70 gigacycles. Two X-band models of the 1-3/4 mode FDTK were successfully operated. Good agreement was obtained between the calculated and measured values of beam conductance required to start oscillations. A peak power output of 16 watts was obtained. It was determined that a short magnetic lens was the focusing best suited for the 70 gigacycle oscillator. A zirconium-coated tungsten cathode was used so that all of the emitted beam would be well within the 20 to 25 degree acceptance angle of the lens. The beam conductance was increased by spacing gridless decelerating electrodes along the converging portion of the beam. The potential distribution on these electrodes was such that the beam voltage was decreased by a factor of four prior to entering the cavity. Guns

of this type were successfully tested, but in the assembled oscillator tube the beam conductance obtained was below the value required to start oscillations. (Author)

AD-613 192 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

Bendix Field Engineering Corp., Owings Mills, Md.
VALIDATION MEASUREMENTS ON LOGARITHMIC AMPLIFIER AM-1724A/FPS-7, SERIAL NUMBER 160.
Final rept.
Mar 65, 44p
Contract AF30 602 2975, Proj. 4557, Task 455701
RADC TDR-64-507

Unclassified report

Descriptors: (*Logarithmic amplifiers, Performance (Engineering)), Radar receivers, Compatibility, Search radar, Radar signals, Radiofrequency interference, Tests.

The validation measurements described in this report present a comparison of logarithmic amplifier characteristics versus normal amplifier characteristics. Three comparison tests are described, each test having been performed under controlled conditions. The three tests are: 1) minimum detectable signal, 2) false alarm time, 3) dynamic range. (Author)

AD-613 195 Div. 8
CFSTI Prices: HC$1.00 MF$0.50

Stanford Research Inst., Menlo Park, Calif.
A POWER SPECTRUM PROGRAM FOR ESTIMATING THE DOPPLER PROFILE OF A RADIO CHANNEL,
by R. F. Daly. Oct 64, 21p
Research memo no. RM-15
Contract DA36 039SC87197, Proj. 3670,
Tasks 04 104, 938 04 014
DASA 1581

Unclassified report

Descriptors: (*Radiofrequency spectroscopy, Doppler effect), (*Doppler effect, Radio communication systems), (*Data processing systems, Radiofrequency spectroscopy), (*Communication theory, Doppler effect), Radio waves, Propagation, High frequency, Mathematical models, Programming (Computers), Radiofrequency power.

This research memorandum describes a data processing technique for analyzing the Doppler-shift properties of a radio channel. A computer program has been developed that computes the power spectrum of power scattered by the radio channel as a function of Doppler shift. This program was developed in conjunction with phase-stable CW experiments which were performed on two HF paths. The program computes the power spectrum of the time variations of the response of the radio channeto a CW tone relative to the transmitted frequency. (Author)

AD-613 196 Div. 8, 25
CFSTI Prices: HC$3.00 MF$0.50

United Aircraft Corp., East Hartford, Conn.
Research Labs.
ULTRASONIC LASER MODULATION TECHNIQUES.
Quarterly progress rept. no. 2, 1 Oct-31 Dec 64,
by A. J. DeMaria, D. E. Flinchbaugh, and G. E. Danielson, Jr. 2 Apr 65, 52p
Rept. no. C-920259-6
Contract DA28 043AMC00259E, Proj. 1P6 22001A056

Unclassified report

Continuation of Contract DA19 020AMC0170A.

Descriptors: (*Lasers, Modulation), (*Light transmission, Modulation), (*Ultrasonic radiation, Modulators), (*Modulators, Ultrasonic radiation), Optics, Acoustics, Refraction. Diffraction, Mathematical models, Analog computers, Interferometers, Neodymium, Glass.

Integral equations describing the slope and trajectories of light rays traversing various periodic refractive index variations are developed. The complexity of the equations led to the use of analog computer techniques for solving three differential ray-trace equations for the slope and trajectories of the light rays. The use of the slope solutions for designing a Fabry-Perot laser interferometer configuration for pulse shaping the output of laser oscillators is described. Experiments are described which demonstrate the feasibility of internally gating the output of a Nd(3+) doped glass laser by coupling focused acoustic energy from a cylindrical transducer to a laser rod through a liquid medium. This liquid coupling technique has eliminated most of the bonding problems arising from the flash lamp and stray laser radiation damage encountered with the previously reported technique of bonding the transducers directly onto the laser rod. Preliminary experiments are reported which demonstrate that no appreciable increase in the deflection of a light beam by acoustic waves can be obtained by maintaining the acoustic medium near a phase transition region. (Author)

AD-613 213 Div. 8, 7, 30
CFSTI Prices: HC$2.00 MF$0.50

Giannini Controls Corp., Duarte, Calif.
BRUSHLESS PRECISION POTENTIOMETER.
Interim development rept. for 5 Nov 64-5 Feb 65.
17 Mar 65, 37p Rept. no. ER-8645-3
Contract Nobsr91175

Unclassified report

See also AD-610 718.

Descriptors: (*Potentiometers, Photoelectric effect), Metal films, Photoelectric materials, Photosensitivity, Sintering, Encapsulation, Semiconductors, Resistance (Electrical), Vapor plating, Vacuum apparatus, Fiber optics, Cadmium compounds, Sulfides, Selenides, Aluminum compounds, Oxides, Reliability (Electronics).

Contents:
Current technical progress
Encapsulation
Contact resistance study
Deposition of photoconductors
Resistance control
Material compatibility
Linearity
Light source survey
Design and build evaluation specimens
Disc layout and mask fabrication
Test evaluation specimens
Preliminary assembly layout
Test fixture.

AD-613 214 Div. 8, 26
CFSTI Prices: HC$1.00 MF$0.50

Silicon Transistor Corp., Long Island, N. Y.
PRODUCTION ENGINEERING MEASURE TO INCREASE THE RELIABILITY OF THE TRANSISTOR TYPE 2N2034.
Quarterly progress rept. no. 6, 1 Oct-31 Dec 64,
by A. Palmerini. 31 Dec 64, 22p
Contract DA36 039AMC01482E Unclassified report

See also AD-609 060.

Descriptors: (*Transistors, Reliability (Electronics)), Processing, Stresses, Thermal stresses, Failure (Mechanics), Shock (Mechanics), Life expectancy, Environmental tests, Vibration, Silicon, Specifications, Military requirements.

The military specification of the Transistor Type 2N2034 has been approved. Results of operating life and some environmental tests showed excellent stability in device parameters. (Author)

AD-613 215 Div. 8, 26
CFSTI Prices: HC$1.00 MF$0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR IMPROVED RELIABILITY OF SOLID ELECTROLYTE TANTALUM CAPACITORS.
Quarterly rept. no. 6, 29 Sep-29 Dec 64,
by J. M. Eckfeldt and J. H. D. Folster. 29 Dec 64, 23p
Contract DA36 039AMC03621E
Unclassified report

See also AD-609 707.

Descriptors: (*Tantalum capacitors, Manufacturing methods), Life expectancy, Tests, Industrial equipment, Soldering, Welding, Metal coatings, Performance (Engineering), Reliability (Electronics), Powder metals.

Sixteen experimental lots of the 330 microfarad-6 V rating (Nos. 31-39, 41, 42, 46, 47, and 49-51) completed life tests during this period, bringing to a conclusion the life testing of preproduction samples of this rating. Descriptions of the composition and processing incorporated in these 16 lots, together with the results of the life tests, are presented. Testing and evaluation of the equipment required for mechanizing the assembly operation continued during this quarter. Six of the seven items of equipment have now been approved for use in final production; the remaining item has been further modified and is now undergoing re-evaluation. (Author)

AD-613 216 Div. 8
CFSTI Prices: HC$1.00 MF$0.50

Army Electronics Command, Fort Monmouth, N. J.
EXPERIMENTS WITH A SYMMETRICAL, GRADIENT-GRID THYRATRON,
by John E. Creedon. Jan 65, 17p
Technical rept. no. ECOM-2554
Proj. 1P6 22001A055, Task 1P6 22001A055 02
Unclassified report

Descriptors: (*Thyratrons, Design), Performance (Engineering), Voltage, Sandwich construction, Ceramic materials, Electric discharges, Modulators, Hydrogen, Electrodes.

A study of the problems associated with the design of high-voltage thyratrons was conducted. The initial device selected for the study is an experimental gradient-grid thyratron that has a symmetrical stacking arrangement to achieve high-voltage holdoff. The design consists basically of a series of split, baffled, cavity grids. The purpose of the cavity is to permit sufficient length on the ceramic spacers to prevent external arcovers. Tests were performed on a 120-kv peak voltage modulator. The modulator consists of a 3.3-microsecond line with a characteristic impedance of 20 ohms, a matched load, and a resonance charging rate of 300 pps. Measurements obtained on a triple-gap structure are discussed. The two-cavity, three-gap geometry is a satisfactory high-voltage structure. Modulator characteristics, such as TAD, delta TAD, minimum E sub bb, and e sub py versus reservoir voltage, were measured. Minimum E sub bb was found to be high. Other characteristics were considered satisfactory. The double cavity permitted operation in air, provided corona from the anode was eliminated. Multiple-gap structures are feasible for operation at voltages in excess of 90 kilovolts. (Author)

AD-613 263 Div. 8, 30
CFSTI Prices: HC$5.00 MF$1.00

Honeywell Inc., Minneapolis, Minn.
A MANUAL DEVICE FOR LOCATING ELECTRIC ARC-PRODUCING FAULTS.
Final technical rept. for 15 Jun 64-Mar 65,
by Richard T. Stevens. Mar 65, 145p
Report no. 20070-FR1
Contract AF33 615 2031, Proj. 8119, Task 811925
APL TR-65-25
Unclassified report

Descriptors: (*Monitors, Radiofrequency interference), (*Radiofrequency interference, Monitors), (*Radio receivers, Portable), Electric arcs, Signal generators, Spectrum analyzers, Noise (Radio), Broadband, Circuits, Audio amplifiers, Radiofrequency amplifiers, Test equipment (Electronics), High frequency, Gain, Malfunctions, Design.

The purpose of the program is to develop a noncontacting portable instrument for locating defective components and circuits which generate RF fields. Initial effort was concerned with a study of the RF spectrum generated by various defective components and circuits. The spectrum was found to be rich in RF noise in the vicinity of 26 megacycles. Accordingly, a portable broad band 26-megacycle radio receiver and associated RF pickups were developed. The receiver was designed for the highest gain and the lowest noise figure attainable in a portable device. Several RF pickups were designed to provide a moderately directional means of coupling to both RF voltage fields and RF current fields. The effectiveness of this equipment was evaluated using specially constructed sources of localized RF fields. The equipment was also used for locating simulated defective circuits and components as well as actually defective circuits and components. These experiments show that circuit and component defects resulting in an electric spark discharge can usually be detected by the receiving equipment. The results also show that extremely low level RF disturbances, such as those generated by noisy diodes, usually cannot be detected by the receiving equipment. (Author)

AD-613 265 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

SFD Labs., Inc., Union, N. J.
X-BAND PHASED ARRAY TUBE DEVELOPMENT.
Quarterly progress rept. no. 1, 16 Nov 64-16 Feb 65,
by S. Sussman. Mar 65, 33p Rept. no. SFD-53-R-1
Contract AF30 602 3633, ARPA Order 136
Unclassified report

Descriptors: (*Phased arrays, X-band), (*Traveling-wave tubes, Phased arrays), Circuits, Coils, Gain, Voltage, Radiofrequency power, Waveguides, Packaging, Magnetic fields, Wave transmission, Performance (Engineering).

The article describes progress of a development

program for a X-band phased array tube. Hot testing of the first series of tubes was completed. These tubes employed a choke supported interdigital line designed to operate in the forward wave space harmonic. The design operating voltage for these tubes was about 15 kv. The best results obtained to date are 5-6 db net gain over about 500 Mc. Peak power output and gain of these tubes was limited by a lower band edge oscillation. Three techniques for the suppression of these oscillations are being investigated. Cold test work on lower voltage versions of these circuits was conducted. A tube of this type is approaching hot test. Effort on bending the input and output waveguide sections, using ridged waveguide bends, was initiated. A study of an alternate slow wave circuit, the reactively loaded interdigital line, is continuing. A magnetic cold tester, employing cylindrical magnets in a shielded package design, was constructed and tested. The initial results indicate that the required magnetic field strengths will be readily obtainable within the dimensions specified. (Author)

AD-613 275 Div. 8, 25, 26
CFSTI Prices: HC$2.00 MF$0.50

Motorola, Inc., Phoenix, Ariz. Semiconductor Products Div.
HIGH SPEED SEMICONDUCTOR SWITCH (TWO TERMINAL) AND HIGH SPEED SEMICONDUCTOR SWITCH (GATE).
Quarterly rept. no. 6, 29 Aug-28 Nov 64,
by B. G. Burlingame and W. F. Munzer. 28 Nov 64, 39p
Contract DA36 039AMC01475E

Unclassified report

Descriptors: (*Semiconductor devices, Manufacturing methods), (*Electronic switches, Semiconductor devices), Semiconductors, Production, Switching circuits, Gates (Circuits), Electric terminals, Trigger circuits, Packaging, Test equipment (Electronics), Silicon coatings, Gold, Cathodes, Preservation, Dies, Design.

Results obtained from studies of the failure mode of the two-terminal device as well as processing techniques including die-cutting, surface cleanup and preservation and assembly methods are discussed. Test equipment design and test results for the engineering samples submitted during the quarter are included. (Author)

AD-613 282 Div. 8, 5
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
THE POWER TRANSFER BETWEEN ARBITRARILY POLARIZED ANTENNAS FROM EXPERIMENTALLY MEASURABLE PARAMETERS.
Interim rept.,
by Irwin D. Olin. 15 Mar 65, 16p
Rept. no. NRL-6212
Proj. RR008 01 41 5552

Unclassified report

Descriptors: (*Antennas, Wave transmission), (*Wave transmission, Antennas), Radiofrequency power, Matrix algebra, Gain, Polarization, Propagation, Radio transmission.

A solution to the problem of power transfer between two antennas in a communication link can be obtained by analyzing each antenna separately. By using a coordinate system associated with each antenna, an analysis can be performed of its gain and polarization properties along the direction of the link. Based on circularly polarized wave components, the analysis results in relatively simple experimental parameters, and is readily adapted to the establishment of a catalog containing numerous antennas. (Author)

AD-613 283 Div. 8
CFSTI Prices: HC$3.00 MF$0.75

Army Electronics Command, Fort Monmouth, N. J.
ELECTRICAL PERFORMANCE DATA OF EXPERIMENTAL DIELECTRIC-TUBE ANTENNAS,
by William Kennebeck. Feb 65, 62p
Technical rept. ECOM-2557
Proj. 100 14501B31A, Task 1C0 14501B31A00 43, 1C0 14501B31A00

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Helical antennas, Glass textiles), (*Glass textiles, Helical antennas), (*Microwaves, Focusing), Pipes, Dielectrics, Performance (Engineering), Antenna radiation patterns, Antenna components, Antenna configurations, Microwave frequency, Standing wave ratios, Helixes, Inflatable structures, Honeycomb cores, Vinyl plastics, Rubber.

The performance characteristics of experimental fiberglass-tube microwave antennas are reported. Their implications regarding future microwave antenna designs and improvement of existing antennas are discussed. (Author)

AD-613 292 Div. 8
CFSTI Prices: HC$1.00 MF$0.50

General Electric Co., Lynchburg, Va.
MICROMINIATURE CRYSTAL UNITS CR-(XM-47)/U.
Quarterly progress rept. no. 6, 1 Nov 64-31 Jan 65,
by John H. Sherman, Jr. Feb 65, 20p
Contract DA36 039AMC02232E, Proj. 1P6 22001A058, Task 1P6 22001A058 01

Unclassified report

See also AD-603 029.

Descriptors: (*Crystal holders, Microminiaturization (Electronics)), (*Microminiaturization (Electronics), Crystal holders), (*Quartz resonators, Microminiaturization (Electronics)), Welding, Electron beams, Hermetic seals, High frequency, Springs, Ceramic materials, Manufacturing methods, Epoxy plastics, Design.

This report details progress made on holder design, resonator design, mounting springs, and electron-beam-weld sealing techniques. The holder base (header) is shown in full on a detail drawing. The resonator (plate) design is outlined for frequencies from 7 mcs to 20 mcs. The fabrication and assembly of mounting springs are described, with notations concerning particular problems. Electron-beam welding is discussed from the general viewpoints of several vendors of electron-beam equipment. (Author)

AD-613 316 Div. 8, 19
CFSTI Prices: HC$3.00 MF$0.75

American Machine and Foundry Co., York, Pa. Product Development Dept.
ASR ANTENNA SYSTEM QUADRUPLE ROTARY JOINT ASSEMBLY TYPE FAA/SRDS-108-31-4D.

Final engineering rept. for 28 Jun 63-14 Feb 64,
by F. Briganti. Jan 65, 62p
Contract FA WA4649, Projs. 108 30, B286 000
SRDS 64-53

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Airport radar systems, Antenna components), (*Search radar, Antenna components), (*Antenna components, Joints), Radar antennas, S band, L band, Rotation, Standing wave ratios, Phase shift, Microwave frequency, Electrical impedance, Waveguides, Model tests, Environmental tests, Manufacturing methods, Design.

The development of a Quadruple Rotary Joint Assembly for the FA-5144 ASR Antenna System is described. The assembly includes an S-band High Power Channel and three L-band Channels. The principle attribute of the S-band Channel is its high power handling capability and low VSWR. This channel was subjected to a high power test and breakdown occurred at 1.375 megawatts with no pressure, and at 2.71 megawatts maximum with 15 psi pressure. The VSWR measured over the band on each unit is less than 1.135. The three L-band Channels were subjected to a high power test and no breakdown occurred up to 100 KW with no pressure. The specified requirement is 25 KW maximum with no pressure. The three L-band Channels tested to a maximum VSWR of 1.2. A 67 db minimum to 86 db maximum isolation between channels was obtained compared to 60 db maximum cross coupling specified between joints. WOW is less than ± .05 over each frequency range throughout the 360 degree rotation. The insertion loss of all channels varied from .07 db minimum to .3 db maximum. Insertion loss was kept to a minimum by the use of silver-graphite bushings to provide effective r-f short circuiting and mechanical centering. (Author)

AD-613 354 Div. 8, 26
CFSTI Prices: HC$5.00 MF$1.00

McCoy Electronics Co., Mount Holly Springs, Pa.
GLASS INCLOSED CRYSTAL UNITS CR-(XM-31)/U.
Final rept.
1965, 167p
Contract DA36 039SC85939

Unclassified report

Descriptors: (*Crystal holders, Production), Miniature electronic equipment, Quartz, Quartz resonators, Glass seals, Glass, Manufacturing methods, Quality control, Life expectancy, Frequency.

Problems and solutions encountered in design fabrication and testing of the CR-(XM-31)/U crystal unit discussed under Section I. Also included is economic information comparing cost factors of metal versus glass holder packaging. In Section II, data obtained in performing various tests on a total of 225 units is presented. Processing details for fabricating the CR-(XM-31)/U crystal unit is outlined under Section III. Section IV consists of a Quality Control and Inspection Plan. The CR-(XM-31)/U, basically a CR-61/U in the HC-26/U holder, is considered a relatively easy specification to meet in the HC-26/U holder; particularly since the frequency tolerance over 85 ±5 degrees C is 20 ppm. A frequency tolerance of ±10 ppm, 85 ±5 degrees C, could be achieved with satisfactory yields. However, from experience, the unit cost would be approximately 50% higher. In utilizing the HC-26/U holder over an HC-18/U crystal unit, costs are greater. The glass HC-26/U holder should find application wherever reliable seals and resultant long-term stability are important factors.

AD-613 355 Div. 8
CFSTI Prices: HC$3.00 MF$0.75

Microwave Electronics Corp., Palo Alto, Calif.
DESIGN AND DEVELOPMENT OF THREE-WATT K sub u-BAND TRAVELING-WAVE TUBE.
Final engineering rept.
Feb 64, 64p
Contract NObsr87501, Proj. SR0080304, Task 9293

Unclassified report

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Descriptors: (*Traveling-wave tubes, K band), Focusing, Magnets, Barium compounds, Ferrites, Electron beams, Electron beams, Electron guns, Helixes, Ceramic materials, Metals, Attenuators, Carbon, Waveguide couplers, Electrical impedance, Cathodes (Electron tube), Design.

This program was directed toward the development and final design of a 3-watt high gain PPM-focused TWT for operation over the 12 to 18 Gc range. A PPM-focused metal ceramic tube was developed which substantially bettered every electrical and mechanical design objective, operating without performance degradation over severe temperature, shock and vibration environments. The resulting TWT package is small and compact, less than 8-1/2 inches long (1/2 inches maximum), 1-7/16 inches on a side in a rectangular cross section (3 inches diameter maximum) and weighing less than 3 pounds (6 pounds maximum). The power output is substantially over 3 watts with more than 38-db gain realized at the 2-watt output level. Various phases of tube development provided many advanced techniques, such as pyrolytic carbon attenuators, temperature-compensated oriented-ferrite magnets, excellent rf waveguide coupling circuits, and a reproducible gun and helix circuit which allowed the manufacture and shipment of 10 tubes of final design having very reproducible characteristics. (Author)

AD-613 365 Div. 8, 26
CFSTI Prices: HC$1.00 MF$0.50

Sprague Electric Co., North Adams, Mass.
PRODUCTION ENGINEERING MEASURE FOR MECHANIZATION OF HIGH RELIABILITY CAPACITORS.
Quarterly rept. no. 8, 30 Sep-30 Dec 64,
by J. H. D. Folster, P. M. Kennedy, and G. E. Walters. 30 Dec 64, 15p
Contract DA36 039AMC01460E

Unclassified report

See also AD-609 235.

Descriptors: (*Paper capacitors, Manufacturing methods), (*Capacitors, Reliability (Electronics)), Electronic equipment, Quality control, Production, Design, Scheduling, Plastics, Soldering, Industrial equipment, Material forming.

Work on the production design engineering and design of pilot line equipment continues. Of the 29 major subassemblies to be used in the mechanized high-reliability capacitor assembly operation, 13 are complete, and another 15 are in various stages of production. The remaining machine is currently being designed. (Author)

AD-613 379 Div. 8, 2

Pacific Naval Lab., Esquimault (British Columbia).
INSTRUMENTATION FOR RECEIVING ELECTRO-

MAGNETIC NOISE BELOW 3000 CPS,
by J. E. Lokken. 1964, 57p Reprint no. 64-8
Unclassified report

Pub. in mono. Natural Electromagnetic Phenomena Below 30kc/s 1964, p373-428 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Atmospherics, Electronic recording systems), (*Electronic recording systems, Atmospherics), (*Radio interference, Extremely low frequency), Electromagnetic waves, Noise (Radio), Magnetometers, Radio receivers, Geophysics, Arctic regions.

The frequency range studied is divided into three bands: the micropulsation band, which extends up to approximately 5 cps and uses quasi-DC receiving systems; the low ELF or Schumann band between approximately 2 cps and the power-line frequency of 50 or 60 cps; and the band which commences at as low a frequency as is consistent with interference from the power line and its harmonics and extends up to a few tens of kilocycles. Each of these bands appears to have its own characteristics as far as spectral level, noise characteristics and siting problems are concerned, and the paper has been divided accordingly. Instrumentation is discussed in detail, and some general factors influencing the design and siting of equipment are reviewed.

AD-613 447 Div. 8, 25

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
HIGHLY IONIZED HOLLOW CATHODE DISCHARGE,
by L. M. Lidsky, S. D. Rothleder, D. J. Rose, S. Yoshikawa, and C. Michelson. 24 Oct 61, 8p
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n8 p2490-7 Aug 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Cathodes, Electric discharges), (*Plasma medium, Cathodes), Gas ionization, Dissociation, Probes (Electromagnetic).

A hollow cathode discharge (HCD) is described that produces a highly ionized steady-state plasma at a temperature 1-10 eV, in a volume as large as 10,000 cu cm, with background neutral gas density = 10 to the 13th power/cu cm. The HCD is generated by the prescription: gas flow (H2, He, A, or N2) 0.05-2 cc STP/sec through a refractory metal hollow cathode tube into a vacuum; any anode; 20-200 V dc applied. An axial induction 100-1000 G is used to collimate the discharge and to aid in starting by rf excitation. The HCD runs from the cathode interior, deep enough that pd=1 cmXmm Hg. Current range is 2.0-300 A. Various electrode configurations and a wide range of operating parameters have been studied. The external plasma density and temperature were measured by Langmuir probes. A discussion is given of the confinement mechanism and of the energy balance, both in the external plasma and in the region of the cathode itself. (Author)

AD-613 466 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRON EMISSION FROM DIELECTRIC LAYERS DURING THE PRESENCE IN THEM OF A STRONG ELECTRICAL FIELD (CONTEMPORARY STATE OF THE ART),
by D. V. Zernov and N. L. Yasnopol'skii.
11 Mar 65, 34p FTD-MT-65-11
TT 65-61955
Unclassified report

Edited machine trans. of Radiotekhnika i Elektronika (USSR) 1964, v. 9, no. 11, p. 1903-1919.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Dielectric films, Electrical properties), USSR, Electrons, Electric currents, Electric fields, Tunneling (Electronics), Cascade structures, Secondary emission.

The article considers the possible mechanisms of electron emission from dielectric layers deposited on a metallic base, in the presence in them of a strong electrical field. On the basis of consideration of totality of data given in literature, the conclusion is made that, depending upon actual conditions, the mechanism of emission can have different nature (tunnel effect, avalanche reproduction of electrons in the layer, etc.). In connection with this, results are discussed of early investigations of the Malter-effect. (Author)

AD-613 540 Div. 8, 26
CFSTI Prices: HC$2.00 MF$0.50

Westinghouse Research Labs., Pittsburgh, Pa.
VAPOR DEPOSITED THIN FILM PIEZOELECTRIC TRANSDUCERS,
by J. de Klerk and E. F. Kelly. Feb 65, 27p
Scientific paper no. SP-64-9F5-108-P1, SR-1
Contract AF19 628 4372, Proj. 4600, Task 460003
AFCRL 65-73
Unclassified report

Descriptors: (*Piezoelectric transducers, Films), (*Films, Vapor plating), Vacuum apparatus, Cadmium compounds, Sulfides, Zinc compounds, Pulse generators, Microwave frequency, Electron diffraction analysis, Crystal structure.

A new vapor deposition technique has been developed for the production of insulating thin film CdS and ZnS piezoelectric transducers. These high efficiency transducers have been used to generate either shear or compressional waves in dielectric materials at frequencies in the gigacycle range. The thickness, which is measured by means of a quartz crystal microbalance, is controlled to produce films which operate at their fundamental resonance. The mode of the generated waves is determined by the orientation of the driving electric field with respect to the crystal axes of the film transducer. (Author)

AD-613 562 Div. 8, 25
CFSTI Prices: HC$6.00 MF$1.50

Motorola, Inc., Phoenix Ariz. Semiconductor Products Div.
MICROWAVE ACOUSTIC DELAY LINE AND RELATED ACTIVE DEVICES.
Final rept. for 17 May 63-17 Jun 64,
by N. G. Sakiotis, W. Brendecke, F. Hickernell, and M. Medina. Feb 65, 264p
Contract AF30 602 3076, Proj. 5578, Task 557802
RADC TDR-64-503
Unclassified report

Descriptors: (*Electroacoustic transducers, Amplifiers), (*Amplifiers, Electroacoustic transducers), (*Delay lines, Electroacoustic transducers), (*Microwave equipment, Delay lines), (*Acoustic

equipment, Delay lines), Ultrasonic radiation, Phonons, Very high frequency, Piezoelectric crystals, Semiconductors, Cadmium compounds, Sulfides, Quartz, Oscillators, Hall effect, Negative resistance circuits, Inverters, Tuning devices, Electromagnets, Test equipment (Electronics)

Theoretical and experimental investigations of electroacoustic interactions were conducted as a basis for development of active and passive acoustic devices. To demonstrate these phenomena, breadboard models of a 60 Mc/sec electroacoustic amplifier with a 75 db maximum acoustic gain, a 200 micro-sec lossless delay line operating at 60 Mc/sec, and a 1 Mc/sec acousto-electric oscillator, were constructed. Both bonded quartz and integral transducers were investigated. An integral delay line and an amplifier demonstrate the use of compensated-layer CdS transducers. Thermal effects are discussed including methods of heat sinking the crystals for use in continuous wave (CW) devices. Combination of Hall and negative-resistance elements were breadboarded for controlling frequency and impedance. (Author)

AD-613 563 Div. 8, 4, 14
CFSTI Prices: HC$4.00 MF$0.75

Weston Instruments, Inc., Newark, N. J.
CHEMICAL FORMATION OF MICROCIRCUIT ELEMENTS.
Final rept. for 28 Jan 63-30 Nov 64,
by T. K. Lakshmanan and J. M. Mitchell. Mar 65, 106p
Rept. no. XS-10977-11286
Contract AF30 602 2971, Proj. 4159, Task 415912
RADC TR-64-561

Unclassified report

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Descriptors: (*Miniature electronic equipment, Materials), (*Metal films, Sputtering), (*Semiconducting films, Sputtering), (*Dielectric films, Sputtering), (*Titanium, Sputtering), (*Sputtering, Miniature electronic equipment), Rutile, Titanium compounds, Oxides, Resistors, Capacitors, Rectifiers, Diodes (Semiconductor), Dielectric properties, Stability, Thermal properties, Impurities, Mechanical properties, Optical properties, Microstructure.

The reactive sputtering technique was applied to form films of titanium and titanium oxide with a wide range of resistivities. Low resistance metallic films and insulating oxide films are found to be suitable for resistor and capacitor microcircuit elements respectively. Dielectric constants of over 100, and reasonably low dissipation factors have been achieved. Data furnished include frequency dependence of capacitor characteristics, voltage breakdown, long term stability of resistor and capacitor elements, temperature coefficients and some basic film properties. The feasibility of using titanium-titanium oxide film contact for rectification is demonstrated. High static rectification ratios are obtained. (Author)

AD-613 568 Div. 8, 4, 14
CFSTI Prices: HC$3.00 MF$0.75

General Telephone and Electronics Labs., Inc.,
Bayside, N. Y.
STUDY OF THIN FILM COMPOUNDS FORMED FROM SIMULTANEOUSLY EVAPORATED CONSTITUENTS.
Final rept. for 1 Jun 63-31 Jan 65,
by M. S. Wasserman, A. K. Hagenlocher, and
A. E. Feuersanger. 31 Jan 65, 65p
Rept. no. TR-65-206.6
Contract DA36 039AMC00105E,
Proj. 1G024401A112

Unclassified report

Continuation of Contract DA36 039SC87302.

Descriptors: (*Capacitors, Films), (*Barium compounds, Titanates), (*Lead compounds, Titanates), Microminiaturization (Electronics), Electrodes, Dielectric properties, Synthesis (Chemistry), Electron beams, Evaporation, Integrated circuits, X-ray diffraction analysis, Crystal structure, Capacitance, Resistance (Electrical), Stability.

Thin films of lead titanate suitable for forming thin-film capacitors have been prepared by the simultaneous evaporation of lead and titanium oxides in an oxygen atmosphere. The experimental conditions for deposition of the films on silicon substrates have been established for obtaining virtually a 100 percent yield of films with a specific capacitance greater than 1 micro F/sq cm, dielectric constants in the range from 200 to 400, and a dissipation factor less than 10 percent. This high reproducibility derives from an improved understanding and control of the vapor-phase oxidation of titanium and of the interactions between the dielectric film and the metal electrodes. The current procedure for synthesis of the lead titanate films is given in detail. An Appendix provides a survey of the literature on previous work on high-dielectric-constant films with the perovskite structure. (Author)

AD-613 593 Div. 8, 2
CFSTI Prices: HC$4.00 MF$0.75

Innsbruck Univ. (Austria).
ON THE PROPAGATION OF VLF WAVES IN SOLIDS.
Annual technical summary rept. no. 4,
by W. Bitterlich. Dec 64, 108p
Contract AF61 052 490
AFCRL 65-203

Unclassified report

Descriptors: (*Very low frequency, Propagation), (*Radio waves, Propagation), (*Rock (Geology), Wave transmission), Meters, Antennas, Direction finding, Radio transmitters, Probes (Electromagnetic), Solids, Magnetic moments, Electric moments, Field theory, Underground antennas.

In the report, different measuring devices, transmitting and receiving antennas (direction-finder antennas) for the VLF region are discussed. The measurements of propagation in inhomogeneous rock are mainly concentrated to the determination of the direction of the field vector at the point of reception. The problem near field - far field of a VLF dipole is also discussed. In order to determine the electrical parameters of rock, comprehensive measurements were conducted in solid rock and in rock samples, furthermore the frequency dependence of sigma and epsilon was studied. The influence of the gallery configuration on the result of a sigma-measurement was studied in detail. The theoretical part mainly deals with the problems of excitation of a VLF wave in rock, giving a detailed comparison between electrical and magnetic dipoles. (Author)

AD-613 605 Div. 8
CFSTI Prices: HC$4.00 MF$0.75

Radio Corp. of America, Cambridge, Ohio.
Communications Systems Div.
MICROMODULE LIFE TEST.

Quarterly progress rept. no. 1, 17 Sep-17 Dec 64,
by G. E. Cannon. 17 Dec 64, 114p
Rept. no. CR-65-589-3
Contract DA36 039AMC01462E

Unclassified report

Descriptors: (*Microminiaturization (Electronics), Modules (Electronics)), (*Modules (Electronics), Life expectancy), Amplifiers, Computer logic, Digital systems, Analog systems, Performance (Engineering), Reliability (Electronics).

Progress is reported on a micromodule life test program is to determine the Mean-Time-To-Failure (MTTF) of a typical analog and a typical digital micromodule when tested for ten thousand (10,000) hours under load at elevated temperature. The causes of micromodule failure during test are to be determined and reported to each supplier of test modules, and at the conclusion of testing, drift characteristics of each micromodule parameter are to be studied to determine attainable tolerance limits for these parameters. The number of failures, accumated operating time, and lower 60% confidence level of mean-time-to-failure for life testing completed during the quarter are reported.

AD-613 607 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.
LINEAR VAN ATTA REFLECTOR CONSISTING OF FOUR HALF-WAVE DIPOLES,
by J. Appel-Hansen. Nov 64, 28p
Scientific rept. no. SR-2, R-40
Contract AF61 052 794
AFCRL 65-205

Unclassified report

Descriptors: (*Phased arrays, Reflectors), (*Reflectors, Electromagnetic waves), (*Dipole antennas, Phased arrays), Electromagnetic waves, Linear systems, Antenna components, Transmission lines, Matrix algebra, Scattering, Antenna radiation patterns, Impedance matching, Electrical impedance, Wave transmission, Mathematical analysis.

A Theoretical and numerical investigation of a linear Van Atta reflector consisting of 4 parallel half-wave dipoles with the same distance between adjacent elements has been made. An expression for the reflected field has been found by considering each dipole as a receiving and transmitting antenna matched to its transmission line. Mutual impedances are taken into account. In order to study the general form of the reradiation pattern analytically the mutual impedances were at first neglected. The analysis reveals, among other things, that the direction of maximum reflection often is not back in the direction of arrival of the incident field, and that for some lengths of the transmission lines and directions of arrival, the reflected field is zero. Numerical calculations have been made with a half wavelength spacing between the elements. It turns out that the induction usually introduces asymmetry into the reradiation pattern. This means that it is possible to increase the radiation back in the direction of arrival by properly choosing the distance between the dipoles and the length of the transmission lines. When the spacing between the dipoles is a half wavelength the most suitable length has been found. (Author)

AD-613 613 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

Lincoln Lab., Mass. Inst. of Tech., Lexington.

DEVELOPMENT OF A LARGE DYNAMIC RANGE TUNNEL DIODE AMPLIFIER FOR PHASED ARRAY RECEIVERS,
Final rept. for 16 Mar-31 Oct 64,
by A. Presser. 31 Oct 64, 50p
Contract AF19 628 500

Unclassified report

Subcontracted to Radio Corp. of America, Harrison, N. J.

Descriptors: (*Tunnel diodes, Microwave amplifiers), (*Microwave amplifiers, Tunnel diodes), Phased arrays, S band, Noise (Radio), Gain, Inductance, Electrical impedance, Stability, Germanium, Gallium alloys, Arsenic alloys, Bandwidth, Admittance.

The objective of this two phase program is to develop large dynamic range S-band tunnel diode amplifiers for phased array receivers. Phase I calls for the development of a prototype amplifier, and phase II for a reproducibility study of amplifiers and an investigation of amplifier characteristics pertinent to phased array applications. This report covers the theoretical and experimental work performed under phase I of the program. The theoretical considerations show that an optimum combination of low noise and large dynamic range can be realized by cascading two amplifiers. The first stage of this amplifier must provide low noise performance, and the second stage large power output. In the experimental amplifiers developed under this program Ge tunnel diodes were used in the first stage and GaAs tunnel diodes in the second stage. These diodes were mounted in special ultra low inductance stripline packages. One two stage tunnel diode amplifier was delivered to Lincoln Laboratories. This amplifier operates at a center frequency of 2.86Gc, has a 1.5db bandwidth of 120Mc, a gain of 17.3db and a noise figure of 5.6db. The amplifier is unconditionally stable and its output power at the 1db gain compression point is -13.7dbm. (Author)

AD-613 614 Div. 8
CFSTI Prices: HC$2.00 MF$0.50

Technical Univ. of Denmark, Lyngby. Lab. of Electromagnetic Theory.
A THEORETICAL INVESTIGATION OF VAN ATTA ARRAYS,
by Tove Larsen. Nov 64, 38p
Scientific rept. no. SR-1, R-39
Contract AF61 052 794
AFCRL 65-162

Unclassified report

Descriptors: (*Phased arrays, Reflectors), (*Reflectors, Electromagnetic waves), Antenna components, Dipole antennas, Transmission lines, Linear systems, Matrix algebra, Scattering, Antennas, Theory, Impedance matching, Electrical impedance, Antenna radiation patterns, Wave transmission, Mathematical analysis.

A scheme has been set up for an analytical investigation of an arbitrary Van Atta reflector. Each pair of antenna elements is represented by an equivalent circuit using equivalent x-circuits for the transmission lines. Reradiation from the elements and mutual impedances have been taken into account. The theory is illustrated with some numerical examples of a linear reflector consisting of four half-wave dipoles. (Author)

AD-613 633 Div. 8, 22, 25
CFSTI Prices: HC$1.00 MF$0.50

Frankford Arsenal, Philadelphia, Pa. Research and

Development Directorate.
THE APPLICATION OF MONOLITHIC INTEGRATED CIRCUITS TO DIGITAL FIRE CONTROL SYSTEMS.
Interim rept.
by Robert F. Munnich. Dec 64, 18p
Memo. rept. no. M65-12-1
Proj. 1C523801A291
Unclassified report

Descriptors: (*Integrated circuits, Fire control systems), (*Fire control systems, Integrated circuits), Design, Modules (Electronics), Microminiaturization (Electronics), Semiconductors, Silicon, Computer logic, Computer storage devices, Digital systems, Feasibility studies.

The report contains an analysis of monolithic integrated circuit characteristics for use in digital fire control equipment. Criteria for selection of integrated modules are developed, and a procedure is indicated for designing systems using integrated circuits. Results of previous work is disclosed and recommendations for future associated efforts are presented. (Author)

AD-613 639 Div. 8
CFSTI Prices: HC$7.00 MF$2.00

General Electric Co., Owensboro, Ky.
C-BAND TRIODE-CAVITY OSCILLATORS, PRODUCTION ENGINEERING MEASURE.
Final rept. for 29 Apr 63-29 Dec 64,
by J. D. Marshall. 29 Dec 64, 380p
Contract DA36 039AMC01474E
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-610 165.

Descriptors: (*Microwave oscillators, Triodes), (*Triodes, Microwave oscillators), C band, Manufacturing methods, Performance (Engineering), Quality control, Ceramic materials, Radiofrequency power, Pulse generators, Life expectancy, Mechanical drawings, Tests, Test equipment.

A summary of the program is given with graphs and illustrations. Investigations resulted in a compatible triode-cavity oscillator capable of meeting an established test specification. A capability in excess of the required 5 units per day of CW and pulsed cavity oscillators was demonstrated. Preproduction and production test reports are included. Drawings of triode parts, cavity parts, and special tooling are presented. The Quality Control and Inspection Manual is included. (Author)

AD-613 647 Div. 8
CFSTI Prices: HC$1.00 MF$0.50

Army Electronics Command, Fort Monmouth, N. J.
TRANSDUCER TILT IN WIDTH-SHEAR MODE DELAY LINES,
by Abraham Rand and Eugene J. Chabak. Jun 64, 23p
Technical rept. ECOM-2391
Proj. 1P6 22001A057, Task 1P6 22001A057 05, 1P6 22001A057 05 09
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Transducers, Delay lines), (*Delay lines, Attenuation), Ferroelectric materials, Ceramic materials, Aluminum, Transmission lines, High frequency, Wave transmission, Misalignment, Phase shifts.

Misalignment of the ferroelectric ceramic transducers in a width-sheer mode ultrasonic delay line is a recognized source of signal attenuation. An evaluation is made of its effect on a 200-microsecond line operating at a center frequency of 10 Mc. Using an aluminum transmission line and controlled localized heating to produce controllable amounts of mislaignment, experimental values were obtained. A simplified analysis provides a theoretical curve which agrees with the experimental values and, in particular, matches well for the smaller degree of misalignment which is of practical interest. (Author)

AD-613 653 Div. 8, 2, 30
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
ATMOSPHERIC REFRACTION CONSIDERATIONS FOR THE 150-FOOT PARABOLOIDAL ANTENNA AT SUGAR GROVE.
Interim rept.
by P. F. Nicholson and C. V. Johnson. Apr 65, 14p Memo. rept. no. NRL-MR-1599 Unclassified report
Proj. RF001 08 41 4553

Descriptors: (*Atmospheric refraction, Radio waves), (*Parabolic antennas, Antenna radiation patterns), (*Radio waves, Atmospheric refraction), Radio astronomy, Astronomical observatories, West Virginia.

Analyses of weather data collected over the past few years at Sugar Grove, West Virginia show that certain simplifications are valid when computing radio refraction angles. An approximation to the classical equation for tropospheric refraction is cited which requires only the local surface weather conditions. Using the Sugar Grove environment, it is demonstrated that the above approximation will yield refraction predictions accurate to within a few seconds of arc for elevation angles greater than 10 degrees and will maintain an accuracy better than 10 percent for elevations as low as five degrees. It is also shown that diurnal variations in refraction at Sugar Grove are relatively small in winter and that suitable mean values can be established. In addition, maximum and minimum bending are given for selected elevation angles based on all 1962 Sugar Grove weather data. Finally, the predicted values of refraction are compared to the main beam pattern of a 150-foot antenna. (Author)

AD-613 662 Div. 8, 6
CFSTI Prices: HC$2.00 MF$0.50

Electronics Research Labs., Columbia Univ., New York.
ELECTRO-OPTICAL SIGNAL PROCESSING TECHNIQUES FOR PHASED ARRAY ANTENNAS.
Quarterly progress rept. no. P-1/321, 1 Oct-31 Dec 64,
by L. Lambert. 31 Dec 64, 46p
Rept. no. CU-3-65-AF-1478-ERL
Contract AF49 638 1478, ARPA Order 279
Unclassified report

Descriptors: (*Phased arrays, Integrators), (*Data processing systems, Communication theory), (*Communication theory, Data processing systems), (*Detection, Phased arrays), Antennas, Electron optics, Light, Modulation, Multiplex, Display systems, Ultrasonic radiation, Lasers, Wave analyzers, Analog systems, Transducers, Simulators.

The results of the electro-optical phased array signal processor research program during the past period are presented. The spatially multiplexed system experimental response for a weighted and unweighted aperture distribution is shown graphically and with photographs. The theoretical and experimental system response for a Hamming type aperture weighting function to signals on and off boresight is presented. An experimental sidelobe suppression of 28 db is demonstrated. A Schlieren photograph of the ultrasonic beams within the light modulator is included. The time multipex system signal simulator implementation and block diagram are presented. The method utilized for phase alignment of the simulator is discussed. (Author)

AD-613 663 Div. 8, 1
CFSTI Prices: HC$4.00 MF$1.00

Meridian Metalcraft, Inc., Whittier, Calif.
WEATHERIZED GLIDE SLOPE ANTENNA AND ARRAY DISTRIBUTION NETWORK.
Final rept.,
by L. M. Struve. Mar 65, 142p
Contract FA WA4511, Proj. 320 101 01N
SRDS RD-65-22

Unclassified report

Descriptors: (*Radar antennas, Radomes), (*Radomes, Ground-controlled approach radar), Dipole antennas, Antenna components, Coupling circuits, Distribution, Networks, De-icing systems, Snow removal, Atmospheric precipitation, Tests, Test methods, Antenna radiation patterns, Design, Manufacturing methods, Protective coverings.

Under phase one, a study and test program of all required parameters for the antenna and distribution network indicated that an antenna using a semi-elliptic radome with provision for heating the antenna element ground plane would produce the optimum design in meeting the all-weather performance requirements. (i.e. deicing, snow removal, rain). It was also determined from array mathematical analysis that the optimum design for a distribution network feeding a 3-element array would be one in which the antennas were spaced 3/4 lambda fed in phase with a voltage excitation of 1.0, 1.0 and 0.5. Phase two consisted of detailed design and manufacture of a number of prototype models of the antenna type recommended. Also included in phase two was design and manufacture of prototype models of the antenna array distribution network, with associated connecting cables and mounting frame.

AD-613 677 Div. 8, 26
CFSTI Prices: HC$1.00 MF$0.50

Chatam Electronics Div., Tung-Sol Electric, Inc., Livingston, N. J.
PRODUCTION ENGINEERING MEASURE FOR TYPE 7890 SUPER POWER HYDROGEN THYRATRON.
Quarterly progress rept. no. 10, 8 Jun-7 Sep 64,
by C. L. Shackelford. 7 Sep 64, 17p
Contract DA36 039SC85984

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-605 329.

Descriptors: (*Thyratrons, Manufacturing methods), Hydrogen, Electron tube parts, Aging (Materials), Life expectancy, Quality control, Water, Cooling, Performance (Engineering), Test equipment (Electronics), Production control, Radiofrequency power.

Preproduction tests, including life tests, were successfully performed and a report prepared. A second aging and test set was modified for use by the 7890. A second set of brazing fixtures was obtained. Conclusions: The tubes reproduced the original test data when formal preproduction tests were made. No trends were observed in the required end point test readings during the life tests. A continuous input water cooling system for the aging and test gear is more satisfactory than a recirculatory system. (Author)

AD-613 678 Div. 8, 26
CFSTI Prices: HC$1.00 MF$0.50

Chatam Electronics Div., Tung-Sol Electric, Inc., Livingston, N. J.
PRODUCTION ENGINEERING MEASURE FOR TYPE 7890 SUPER POWER HYDROGEN THYRATRON.
Quarterly progress rept. no. 11, 8 Sep-7 Dec 64,
by C. L. Shackelford. 7 Dec 64, 12p
Contract DA36 039SC85984

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-613 677.

Descriptors: (*Thyratrons, Manufacturing methods), Hydrogen, Electron tube parts, Stability, Design, Performance (Engineering), Radiofrequency power, Production control, Graphics.

The Preproduction Report was issued. A mechanical sample tube was supplied for display purposes. Data on stability of improved tubes was obtained.

AD-613 685 Div. 8, 15, 30

RAND Corp., Santa Monica, Calif.
MACHINE ANALYSIS METHODS FOR NETWORK VULNERABILITY PROBLEMS,
by M. L. Juncosa. 25 Mar 59, 26p
Rept. no. P-1723

Unclassified report

Presented at the RAND Protective Construction Symposium (2nd), 24-26 Mar 59
Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Optimization, Communication systems), (*Communication systems, Vulnerability), (*Programming (Computers), Networks), Linear programming, Mathematical models, Coding, Communication theory.

A brief review of some optimization problems involving communication networks that are usually of such size as to require a high-speed computer for solution. Some parallelisms and translations between different problems are also illustrated. (Author)

AD-613 687 Div. 8, 25, 26
CFSTI Prices: HC$3.00 MF$0.75

TRW Semiconductors, Inc., Lawndale, Calif.
PRODUCTION ENGINEERING MEASURE. RELIABILITY THROUGH PROCESS IMPROVEMENT (EXTENSION TO 2N2525 TRANSISTOR FAMILY).
Quarterly rept. no. 2, 1 Sep-30 Nov 64,
by G. Erkan and ed. by E. H. Roos. 30 Nov 64, 77p
Contract DA36 039SC86742E Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-608 725.

Descriptors: (*Transistors, Manufacturing methods), Reliability (Electronics), Cold working, Packaging, Welding, Joints, Ceramic materials, Failure (Mechanics), Semiconductors, Hermetic seals, Molybdenum, Stresses.

Studies on cold-welding as the final closure operation were completed and the die design finalized. The dynamic forces exerted on the welded parts was reduced to a minimum while the tightness of the joints made is maintained. Analytical work was done to establish the residual stresses developed and the modes of failure experienced on ceramic-to-metal semiconductor enclosures; the header design was modified. The compression seals to the ceramic achieved by the use of molybdenum feedthrough pins was found to be the most suitable. The emitter lead geometry used in the case of the pin feedthrough for the emitter lead continuity to the external radial leads is highly inductive. The frequency response of the package can be improved substantially by by-passing such an inductive lead geometry and using the flang itself as the emitter contact. (Author)

AD-613 692 Div. 8
CFSTI Prices: HC$1.00 MF$0.50

Air Force Cambridge Research Labs., Bedford, Mass.
ENERGY SOURCE REQUIREMENTS FOR RELIABLE CIRCUITRY.
Scientific rept.,
by Walton B. Bishop. Feb 65, 16p
AFCRL-65-110, PSRP-80
Proj. 4608, Task 460805
Unclassified report

Pub. in National Symposium on Reliability and Quality Control (no. 11) Miami Beach, Fla. Jan 65.
Proceedings p427-33.

Descriptors: (*Circuits, Reliability (Electronics)), (*Power supplies, Circuits), Energy, Integrated circuits, Probability, Fuel cells, Dry cells, Feasibility studies.

A very simple analysis of circuit reliability when the source of energy of 'power supply' is included shows that small independent sources of energy are needed. Several possible ways of satisfying this intuitively obvious need are discussed. Very small independent sources of energy could be used quite effectively in electronic circuitry design. Redundancy techniques can be used to overcome low reliability of such sources. Their use would remove the power supply from its status as a 'vital organ' in electronic equipment. The reduction in number and length of interconnections resulting from the use of small independent sources of energy offers the possibility of improved fabrication techniques for integrated circuitry. More research and development effort on small energy sources is needed. (Author)

AD-613 718 Div. 8, 26
CFSTI Prices: HC$1.00 MF$0.50

Midland-Wright, Kansas City, Kans.
CR-(XM-44)/U: MODERATE PRECISION GLASS ENCLOSED CRYSTAL UNITS.
Quarterly progress rept. no. 10, 1 Jul-30 Sep 64,
by Robert Kinsman. 30 Sep 64, 19p
Contract DA36 039SC86717
See also AD-610 825. Unclassified report

Descriptors: (*Crystal holders, Manufacturing methods), (*Quartz resonators, Manufacturing methods), High frequency, Quartz, Crystals, Encapsulation, Glass, Specifications, Crystallography, Tests.

The preproduction crystals to be fabricated from natural quartz were completed. This consists of seven crystals each at 5MC, 10MC and 20MC. Some preproduction crystals were fabricated from cultured quartz but design problems with respect to temperature characteristics were encountered. The production crystal designs for the units to be fabricated from natural quartz were finalized on the basis of the engineering samples. These designs are included in this report. (Author)

AD-613 784 Div. 8

Electrical Engineering Research Lab., Univ. of Illinois, Urbana.
HIGH-GAIN DYNAMIC MICROWAVE PHOTOMULTIPLIER.
Revised ed.,
by O. L. Gaddy and D. F. Holshouser. 4 Dec 61, 2p
Contract AF49 638 556
AFOSR 3291
Unclassified report

Pub. in Institute of Electrical and Electronics Engineers. Proceedings (U.S.) v50 n2 Feb 1962
Copies not available to DDC or Clearinghouse customers.
Revision of manuscript submitted 16 Nov 61.

Descriptors: (*Photomultipliers, Microwave frequency), Design, Electron multipliers, Instrumentation.

The purpose of the note is to report on recent experimental results with a photomultiplier which is capable of microwave response and to briefly describe the multiplication method which is called dynamic crossed-field electron multiplication (DCFEM). This multiplication method is realized by providing a region of two spatially uniform fields--a microwave electric field and a crossed steady magnetic field--bounded by two electrodes, one having a high secondary emission ratio delta (active electrode), and the other a relatively low delta (inactive electrode). An electron which is present at the surface of the active electrode during a portion of the microwave period gains energy from the electric field and has a path which is curved by the magnetic field so that it is returned to the active electrode, producing secondary electrons upon arrival. This trajectory, labelled 'normal', is repeated by the secondary electrons; and after n such multiplication steps, requiring precisely n microwave periods, delta to n power electrons may be collected and delivered to an external circuit.

AD-613 811 Div. 8, 30

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A LAMBDA/4 AND LAMBDA/2 SHIFT METHOD FOR ELIMINATION OF UNWANTED WALL-ECHOES IN RADAR-ANECHOIC CHAMBERS,
by J. H. Halberstein and P. C. Fritsch. 22 Jul 64,
1p Rept. no. JA-2404
Contract AF19 628 500
Unclassified report

Pub. in Institute of Electrical and Electronics Engineers. Proceedings (U. S.) v52 n12 p1743-4 Dec 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Anechoic chambers, Radar echo areas), (*Radar echo areas, Scattering), Interference, Radar reflections.

Bodies with small radar backscatter cross sections scatter most of the energy falling on them in the forward direction. Since this energy is partly reflected from the walls of the anechoic chamber back into the receiver antenna, the measurement of small backscattering cross sections in an indoor CW range has presented considerable difficulties. A solution to this problem is proposed. By measuring six vectors as functions of the aspect angle and carrying out a number of vector operations, it was found possible to reduce substantially the interference caused by the walls of the anechoic chamber.

AD-613 828 Div. 8, 2, 6

Air Force Cambridge Research Labs., Bedford, Mass.
A DEMONSTRATION OF ANTENNA BEAM ERRORS IN RADAR REFLECTIVITY PATTERNS.
Environmental research papers, (revised ed.),
by Ralph J. Donaldson, Jr. 6 Jul 64, 21p
AFCRL 65-139, ERP-90
Proj. 6672, Task 667203

Unclassified report

Pub. in Journal of Applied Meteorology (U. S.) v3 n5 p611-23 Oct 1964 (Copies not available to DDC or Clearinghouse customers). Revision of manuscript submitted 16 Apr 64.

Descriptors: (*Antenna radiation patterns, Errors), (*Radar reflections, Antenna radiation patterns), Distortion, Azimuth, Reflections, Meteorological radar, Thunderstorms, Models (Simulation), Sensitivity.

Measurement errors caused by antenna main-lobe distortion are computed for seven model thunderstorm reflectivity distributions observed over various ranges by model antenna beams with half-power widths of one and two degrees. Errors in echo top height measured by the two-degree beam, somewhat larger than the one-degree beam errors, rarely exceed ±5000 ft at ranges up to 25 n mi. In very intense storms, however, and at ranges of 50 mi or more, the measured echo top may be displayed at least 20,000 ft above the actual storm top. In extreme situations the displayed echo top may be double the true storm top. Measured maximum reflectivity may decrease with range by as much as 8 db at 50 mi. However, the reflectivity measured at 30,000 ft roughly midway between maximum reflectivity and storm top, is largely independent of range out to 150 mi. The detectability of a hole surrounded by intense precipitation may be dependent on reduced radar sensitivity. A fairly accurate estimate of hole size is not possible unless its edges are sharp and its actual width exceeds twice the half-power antenna beam width. Several methods are considered for correcting antenna beam distortion of echo tops. None of them are versatile enough to be used with confidence in all cases. The most promising one for sharp-edged reflectivity structures is a nomogram technique suggested by Probert-Jones, wherein side-lobe errors are eliminated by suitable reduction in radar sensitivity. (Author)

AD-613 885 Div. 8

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE FREQUENCY DEPENDENCE OF THE POWERS AND IMPEDANCES OF VARACTOR FREQUENCY MULTIPLIERS,
by A. I. Grayzel. 6 Apr 64, 1p Rept. no. JA-2351
Contract AF19 628 500

Unclassified report

Pub. in Institute of Electrical and Electronics Engineers. Proceedings (U. S.) p1056-7 Sept 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Frequency multipliers, Varactor diodes), (*Frequency, Power), (*Electrical impedance, Frequency), Potential theory, Fourier analysis, Series, Design.

The results given imply that if a higher order multiplier which cannot be easily analyzed is designed experimentally at some frequency it can be scaled to any other frequency.

AD-613 887 Div. 8

Lincoln Lab. Mass. Inst. of Tech., Lexington.
DIAGONAL REPRESENTATION OF THE RADAR SCATTERING MATRIX FOR AN AXIALLY SYMMETRIC BODY,
by Sidney L. Borison. 20 Jul 64, 2p
Rept. no. JA-2409
Contract AF19 628 500

Unclassified report

Pub. in I E E E Transactions on Antennas and Propagation (U. S.) vAP-13 n1 p176-7 Jan 1965 (Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Radar signals, Scattering), Matrix algebra, Propagation, Electromagnetic waves, Antenna configurations, Magnetic fields, Polarization.

9. Fluid Mechanics

AD-613 162 Div. 9, 1, 30
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DEVICE FOR SIMULATING THE EFFECT OF AERODYNAMIC FORCES ON THE RUDDER AND AILERONS,
by E. L. Kozhevnikov and A. S. Tarasov. 18 Mar 65, 7p FTD-TT-64-1117
TT 65-61859

Unclassified report

Unedited rough draft trans. of Russian patent 154420, appl. 788276/40-23, 23 Jul 62.

Descriptors: (*Simulators, Aerodynamic loading), (*Aerodynamic loading, Simulators), (*Ailerons, Aerodynamic loading), (*Aerial rudders, Aerodynamic loading), Aerodynamic control surfaces, Design, Patents, USSR.

A device was invented which simulates the action of aerodynamic forces on the rudder and ailerons. It is designed in the form of a cantilever with a roller fastened on the load-bearing surface of control (of rudder and aileron) and a shaped lever sliding over the roller, the other end of the lever being fastened on a 'torsion' (something like a shaft that turns) in a movable bearing.

AD-613 174 Div. 9, 30
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF RECORDING A GAS FLOW VELOCITY FIELD,
by V. M. Kalugin and L. V. Leskov. 18 Mar 65, 4p FTD-TT-64-1085
TT 65-61863

Unclassified report

Unedited rough draft trans. of Russian patent 160916, appl. 763008/26-10, 30 Jan 62.

Descriptors: (*Gas flow, Velocity), (*Recording systems, Gas flow), Measurement, Electron beams, Ions, Motion picture photography, Patents, USSR.

A method of recording the field of velocities of a gas flow was devised. For the purpose of obtaining a continuous field of velocities of the flow, a cinematographic record was made of the process of the drift of the front of the afterglow of a gas excited by a focused electron beam. (Author)

AD-613 327 Div. 9
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
OPTIMUM HYPERSONIC LIFTING SURFACES CLOSE TO FLAT PLATES,
by J. D. Cole and J. Aroesty. Mar 65, 10p
Rept. no. P-3094

Unclassified report

Descriptors: (*Hypersonic flight, Lift), (*Lift, Optimization), (*Airfoils, Lift), Hypersonic flow, Perturbation theory, Surfaces, Mathematical analysis.

Consideration is given to the lower surface of a lifting airfoil which is close to a flat plate in shape. The lift-to-drag ratio is analyzed mathematically.

AD-613 334 Div. 9
CFSTI Prices: HC$2.00 MF$0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
INVESTIGATIONS OF THE FLOW AROUND THE AFTERBODY OF AN AIRCRAFT OR ROCKET,
by P. Carrière. Feb 65, 38p RSIC-369
TT 65-61939

Unclassified report

Trans. of Technique et Science Aéronautiques et Spatiales (France) 1962, v. 1, p. 31-45.

Descriptors: (*Aerodynamic characteristics, Fluid flow), (*Aircraft, Fluid dynamic properties), (*Rockets, Fluid flow), Drag, Stagnation point, Viscosity, Theory, Laminar flow, Boundary layer, France.

AD-613 372 Div. 9
CFSTI Prices: HC$3.00 MF$0.75

Iowa Inst. of Hydraulic Research, Iowa City.
FREE-SURFACE EFFECTS ON TURBULENT-BOUNDARY-LAYER SEPARATION,
by Shin-Kien Chow. Mar 65, 70p
Contract Nonr161101

Unclassified report

Descriptors: (*Turbulent boundary layer, Separation), (*Hydrofoils, Turbulent boundary layer), Surface properties, Flow visualization, Models (Simulations), Graphics, Angle of attack, Towed bodies.

The experimental investigation consists of two parts. Part I is a study of flow separation on a hydrofoil. A symmetrical, two-dimensional hydrofoil was towed with its plane of symmetry first parallel to the undisturbed free surface, and then at various angles of attack, at various velocities and depths. Part II is a study of flow separation on three stationary vertical struts passing through the free surface. In order to observe conveniently the flow pattern and the separation position, the experiment was performed in a glass-walled flume. Wall effect on separation was also studied in this flume by varying the ratio of the channel width to the model thickness.

AD-613 383 Div. 9, 30

Institute for the Study of Metals, Univ. of Chicago, Ill.
EXPERIMENTS ON THE STABILITY OF VISCOUS FLOW BETWEEN ROTATING CYLINDERS. V. THE THEORY OF THE ION TECHNIQUE,
by R. J. Donnelly and D. J. Tanner. 2 Jul 64, 12p
Contract Nonr212120; Grant NSF G23068

Unclassified report

Pub. in Royal Society of London. Proceedings. Series A. Mathematical and Physical Sciences (Gt. Brit.) v283 p520-30 1965. Copies available only to DDC users.

Descriptors: (*Measuring devices (Electrical and Electronics), Fluid mechanics), (*Fluid flow, Pipes), (*Flowmeters, Measuring devices (Electrical and Electronic)), Perturbation theory, Stability, Viscosity, Vortices, Ions, Electric currents, Electrochemistry, Rotation, Cylindrical bodies, Numerical methods and procedures.

The theory underlying the ion technique described in part IV (AD-613 384) of this series is developed: the equations are written down and solved under certain simplifying assumptions which appear physically reasonable. The results explain observations made in part IV by showing, in particular, that the current changes are linearly proportional to the radial component of the perturbations on the flow. (Author)

AD-613 384 Div. 9, 30

Institute for the Study of Metals, Univ. of Chicago, Ill.
EXPERIMENTS ON THE STABILITY OF VISCOUS FLOW BETWEEN ROTATING CYLINDERS. IV. THE ION TECHNIQUE,
by R. J. Donnelly. 2 Jul 64, 12p
Contract Nonr212120; Grant NSF G23068
Unclassified report

Pub. in Royal Society of London. Proceedings. Series A. Mathematical and Physical Sciences (Gt. Brit.) v283 p509-19 1965.
Copies available to DDC users.

Descriptors: (*Measuring devices (Electrical and Electronic), Fluid mechanics), (*Fluid flow, Pipes), (*Flowmeters, Measuring devices (Electrical and Electronic)), Perturbation theory, Stability, Viscosity, Vortices, Ions, Rotation, Cylindrical bodies, Electric currents, Carbon tetrachloride.

The development of an instrument which responds to the radial component of a Taylor vortex is described. The method is to measure the current passing through the vortex in a fluid of low conductivity, such as carbon tetrachloride. Experiments, performed to check the usefulness of the technique are reported. (Author)

AD-613 385 Div. 9, 30

Institute for the Study of Metals, Univ. of Chicago, Ill.
EXPERIMENTS ON THE STABILITY OF VISCOUS FLOW BETWEEN ROTATING CYLINDERS. VI. FINITE-AMPLITUDE EXPERIMENTS,
by R. J. Donnelly and K. W. Schwarz. 2 Jul 64, 26p
Contract Nonr212120; Grant NSF G23068
Unclassified report

Includes Appendix: The Solution of the Characteristic Value Problems, by P. H. Roberts.
Pub. in Royal Society of London. Proceedings. Series A. Mathematical and Physical Sciences (Gt. Brit.) v283 p531-46 1965
Copies available only to DDC users.
See also AD-613 383.

Descriptors: (*Measuring devices (Electrical and Electronic), Fluid mechanics), (*Fluid flow, Pipes), (*Flowmeters, Measuring devices (Electrical and Electronic)), Couette flow, Stability, Viscosity, Vortices, Perturbation theory, Ions, Electric currents, Rotation, Cylindrical bodies, Data processing systems.

The ion technique is applied to a variety of experiments in Couette flow: determination of the critical Taylor number; determination of wavenumber and waveform of the vortices; establishment of the laws that the square of the amplitude and the amplification factor both vary as the difference between the Taylor number and the critical Taylor number; and finally certain studies of the growth and decay of vortices as the Taylor number is changed. The experimental data are compared with the results of integration of the exact equations for the linear stability problem by means of a high-speed computer. These theoretical values were obtained by P. H. Roberts and are presented in an appendix to this paper. (Author)

AD-613 386 Div. 9, 25

Chicago Univ., Ill.
THE MAGNETOHYDRODYNAMIC SQUEEZE FILM,
by Russell J. Donnelly, Dennis C. Kuzma, and E. Roland Maki. 26 Nov 63, 7p
Grant NSF G23068
Unclassified report

Pub. in Journal of Fluid Mechanics (Gt. Brit.) v19 pt3 p395-400 1964 (Copies available only to DDC users)
Prepared in cooperation with General Motors Research Labs., Warren, Mich.

Descriptors: (*Magnetohydrodynamics, Moment of inertia), Fluid mechanics, Mercury, Films, Theory, Experimental data, Lubrication.

Magnetohydrodynamic squeeze films are investigated theoretically and experimentally. The theory of magnetohydrodynamic lubrication as applied to squeeze films is extended to include fluid-inertia effects and buoyant forces. Excellent agreement is obtained between theory and experiment. (Author)

AD-613 458 Div. 9
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
DISTRIBUTION OF ELECTROMAGNETIC FIELD AND CURRENT IN THE GROUND IN THE CASE OF A VERTICAL ANTENNA,
by I. Constantinescu. 30 Mar 65, 14p
FTD-TT-65-78
TT 65-61949
Unclassified report

Edited trans. of Telecomunicatii (Rumania) 1963, v. 7, no. 2, p. 45-50.

Descriptors: (*Dipole antenna, Propagation), Rumania, Electromagnetic fields, Electric currents, Partial differential equations, Distribution.

A method of rectangular coordinates in the case of radial fields is used to determine the distribution of electromagnetic field and current in the ground in the case of a vertical antenna.

AD-613 463 Div. 9
CFSTI Prices: HC$3.00 MF$0.75

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
SEPARATED FLOW STUDIES AT HYPERSONIC SPEEDS. PART II. TWO-DIMENSIONAL WEDGE SEPARATED FLOW STUDIES,
by Michael Holden. Dec 64, 70p
Rept. no. CAL-AF-1285-A-13(2)
Contract Nonr265300
Unclassified report

See also AD-612 758.

Descriptors: (*Hypersonic flow, Separation), (*Wedges, Two-dimensional flow), (*Heat transfer, Aerodynamic configurations), Aerodynamic heating, Shock waves, Laminar boundary layer, Flat plate models, Schlieren photography, Measurement.

The paper describes an experimental study of the flow patterns and distribution of heat transfer developed in regions of adverse pressure gradient and separated flow over two-dimensional models. The investigation was directed towards obtaining information on two basic problems, the separation and the reattachment of a laminar boundary layer.

AD-613 467 Div. 9
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
CALCULATION OF FLOW OF A HYPERSONIC GAS STREAM DIRECTED AROUND AXIALLYSYMMETRICAL BODIES,
by A. M. Antonov. 22 Mar 65, 10p
FTD-TT-64-1005
TT 65-61956
Unclassified report

Unedited rough draft trans. of Akademiya Nauk URSR, Kiev. Dopovidi, 1964, no. 2, p. 188-193.

Descriptors: (*Hypersonic flow, Perturbation theory), (*Conical bodies, Hypersonic flow), Numerical analysis, Partial differential equations, Nonlinear differential equations, USSR.

In this report equations of second approximation are investigated of the hypersonic theory of small perturbations. The system of equations, which was obtained by introducing a flow function of second approximation, is reduced to one nonlinear differential equation in partial derivatives. Discussed is also the problem of directing a hypersonic flow around conical bodies. Numerical calculations indicate, that the possibility of expanding the zone of applying the theory of small turbulences (perturbations), considering other approximations, in case of a flow directed around much thicker cones, rather than according to the theory of first approximation. (Author)

AD-613 485 Div. 9
CFSTI Prices: HC$3.00 MF$0.75

Mississippi State Univ., State College.
A STUDY OF JET EJECTOR PHENOMENA,
by Chia-An Wan. Nov 64, 61p
Research rept. no. RR-57
Contract Nonr97803
Unclassified report

Descriptors: (*Jet pumps, Fluid mechanics), Jets, Velocity, Fluid flow, Boundary layer, Momentum, Transport properties, Boundary value problems, Equations, Nozzles, Thrust.

The mixing process within the ejector is an interchanging of momentum and energy among each stratum of the flow field. As soon as the ambient air is entrained into the ejector, the interchanging of momentum and energy occurs. Particles or groups of particles in the flow field which have possessed less momentum and energy will receive some amount of external momentum and energy, and on the other hand, particles or groups of particles which are at higher energy and momentum level will lose some.

AD-613 496 Div. 9, 25

Brown Univ., Providence, R. I.
CALCULATION OF THE SPALDING FUNCTION OVER A RANGE OF PRANDTL NUMBERS,
by G. O. Gardner and J. Kestin. 11 Sep 62, 12p
Unclassified report

Pub. in International Journal of Heat and Mass Transfer (England) v6 p289-99 1963 (Copies available only to DDC users).

Descriptors: (*Heat transfer, Turbulent boundary layer), (*Turbulent boundary layer, Heat transfer), Tables, Thermal conductivity, Viscosity, Thermal diffusion, Friction.

An extensive tabulation is presented of the Spalding function = SP/square root (.5c), where S = Stanton number, P = Prandtl number, c = skin-friction coefficient. This tabulation is useful in the calculation of heat transfer rates into fully developed turbulent boundary layers. Numerical data are presented for P = 0.71, 1, 7, 30, 100, and 1,000. (Author)

AD-613 548 Div. 9, 1
CFSTI Prices: HC$4.00 MF$1.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AIRCRAFT IN-FLIGHT HEATING,
by L. G. Raikov. 11 Mar 65, 123p FTD-MT-64-269
TT 65-61967
Unclassified report

Edited machine trans. of mono. Nagrev Letatel'nykh Apparatov v Polete, Moscow, 1962, 100p
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Supersonic planes, Aerodynamic heating), (*Aerodynamic heating, Supersonic planes), Heat-resistant metals and alloys, Aerodynamic configurations, Thermal stresses, Metallography, Heat transfer, High-temperature research, USSR.

The basic questions of aerodynamic heating of supersonic aircraft as expounded and peculiarities of structures brought about by this heating are considered. The author mentions sources of heating of aircraft, determination of temperature fields of supersonic aircraft, rockets and spaceships an example of satellites, the properties of materials at high temperatures and presents data on new materials and coverings able to sustain increased thermal loads. A significant place in this work is occupied also by questions of durability of structures of aircraft in conditions of high temperatures. Furthermore, the book mentions how, on the basis of correct analysis and manifold calculation of phenomena of aerodynamic heating, it is possible to create corresponding efficient designs. Explanations are illustrated by examples of designs of supersonic aircraft and rockets, and also engines of different systems and equipment. The book is based on materials of foreign literature. (Author)

AD-613 569 Div. 9
CFSTI Prices: HC$3.00 MF$0.75

Boeing Scientific Research Labs., Seattle, Wash.
REGULAR DISTURBANCES IN THE TURBULENT BOUNDARY LAYER,
by J. D. McClure. Jan 65, 56p
Flight sciences lab. rept. no. FSL-92, D1-82-0397
Unclassified report

Also available from the author.

Descriptors: (*Turbulent boundary layer, Perturbation theory), Supersonic flow, Laminar flow, Boundary layer, Pressure, Surfaces, Viscosity, Mathematical analysis.

A theory for traveling-wave disturbances in the fully turbulent boundary layer is developed on the basis of an analogy with laminar viscous flow. The point of view that the flow perturbations are induced by a prescribed wall disturbance is adopted, but the results are basic to studies of the stability of disturbances in a flexible wall and the adjoining flow. The analogy with the laminar flow, which is constructed by averaging over an ensemble of turbulent flows, is complete for the flow of an incompressible fluid over a wall that has no random component of deformation and holds for the first term of an iterative solution in the more general case.

AD-613 574 Div. 9, 15, 22
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
INVARIANT TRANSFORMATION OF EQUATIONS OF MOTION OF IDEAL MONATOMIC GAS AND NEW CLASSES OF THEIR ACCURATE SOLUTIONS.
by A. A. Nikol'skii. 7 Apr 64, 19p FTD-MT-63-273
TT 65-61968

Unclassified report

Edited machine trans. of Prikladnaya Matematika i Mekhanika (USSR) 1963, v. 27, no. 3, p. 496-508.

Descriptors: (*Hydrodynamics, Gases), (*Gases, Hydrodynamics), (*Partial differential equations, Hydrodynamics), (*Transformations (Mathematics), Partial differential equations), Kinetic theory, Explosions, Explosive gases, Compressive properties, USSR.

The transformation is considered of equations of motion of ideal monatomic gases to coordinates of uniform expanded space. With the corresponding transformation of time, fields of speeds, pressures, density, and temperature in new variables the same equation of motion is obtained as in fixed coordinates. All usual gasdynamics may be extended to the dynamics of expanded gas and available accurate solutions of equations of gasdynamics compared to the new accurate solutions. During the considered new motions of gas for an infinite interval of time t processes are realized similar to those for the initial usual motions of gas in a finite interval of time. The motion of gas is investigated with surfaces of discontinuity (strong discontinuity, tangential discontinuity). Fundamental theorems for such flows are proven. Examples of new accurate solutions are considered. The problem pointwise explosion in a uniformly expanded and uniformly compressed gas is investigated. (Author)

AD-613 625 Div. 9

Institute for Fluid Dynamics and Applied Mathematics, Univ. of Maryland, College Park.
AN INVESTIGATION OF THE EFFECT OF THE WALL BOUNDARY LAYER ON THE WAKE OF AN OBSTACLE PROTRUDING FROM THE WALL,
by Richard Harrison Love. Aug 63, 80p
Technical note BN-370
Contract Nonr59507

Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Wake, Fluid dynamic properties), (*Turbulent boundary layer, Cylindrical bodies), (*Cylindrical bodies, Turbulent boundary layer), Boundary layer, Laminar flow, Three-dimensional flow, Surfaces, Flat plate models, Stagnation point, Vortices, Instrumentation, Calibration.

The experiment was carried out in order to investigate the flow behind various cylindrical obstacles placed in a turbulent boundary layer formed along the wall from which the obstacles protruded. Obstacles either extended completely through the boundary layer or protruded only partly into the boundary layer from the wall.

AD-613 641 Div. 9
CFSTI Prices: HC$4.00 MF$1.00

Carnegie Inst. of Tech., Pittsburgh, Pa.
UNCONVENTIONAL METHODS FOR INFLUENCING FLUID FLOW. PART I. ACOUSTIC PUMPING.
Final rept., pt. 1, Oct 62-Sep 64,
by James L. McElroy. Feb 65, 124p
Contract AF33 657 9914, Proj. 8169, Task 816904
APL TR-64-133 P1

Unclassified report

Doctoral thesis.

Descriptors: (*Fluid flow, Acoustics), (*Pumps, Fluid flow), Acoustic equipment, Fuel pumps, Jet pumps, Nozzles, Performance (Engineering), Fourier analysis, Theory, Digital computers.

The general system of equations describing the properties of an arbitrary fluid subjected to periodic disturbances are developed. A method of solution is proposed involving the Fourier expansion of the unknown functions to an arbitrary approximation. The problem of acoustic streaming between parallel plates is solved by the proposed method. Results of the streaming calculations are applied to a possible acoustic absorption pump. Significant pumping outputs are calculated but predicted efficiencies are shown to be very low. The relation between an acoustic pump and a jet pump is discussed and reason for the low calculated efficiencies stated. Another variant of acoustic pump, the resonant cavity pump, is discussed qualitatively and some experimental results presented. The pumping mechanism is shown to be the rectifying effect of a nozzle or orifice on the periodic flow between the resonant cavity and an infinite reservoir. The pump is shown to be of a reasonably high efficiency but limited to low outputs. (Author)

AD-613 704 Div. 9, 30
CFSTI Prices: HC$3.00 MF$0.75

Case Inst. of Tech., Cleveland, Ohio.
FLUID AMPLIFICATION: 13. FLUID ANALOG TO DIGITAL CONVERSION SYSTEM,
by James N. Wilson. 30 Dec 64, 85p
Contract DA49 186AMC79D, Projs. 1P010501A001, 31100

Unclassified report

Descriptors: (*Fluid flow, Amplifiers), (*Amplifiers, Fluid flow), (*Analog-to-digital converters, Fluid flow), Computer logic, Digital-to-analog converters, Counting methods, Feedback, Digital systems, Nozzles, Jets, Pneumatic systems, Control systems, Pulse amplifiers, Feedback amplifiers.

The design and development of a fluid analog to a digital conversion system are described. The system represents the digital portion of an incremental fluid control system and consists of a fluid quantizer, direction-sensing circuit and four-stage binary bidirectional counter. The system operates at over 100 pulses per second. A method of quantizing an analog quantity, using a fluid as the information transmission medium, is examined and evaluated. The design of suitable fluid logic elements is described. Techniques are developed by which characteristics of these elements can be exploited for logic circuit synthesis. An engineering model

is developed for predicting the dynamic characteristics of bistable fluid amplifiers. The dynamic behavior predicted by the model, in conjunction with experimental data, is used in discussing the factors that affect the speed of operation of logic circuits. Methods by which the speed of operation of logic circuits can be increased are also outlined. (Author)

AD-613 706 Div. 9, 12
CFSTI Prices: HC$1.00 MF$0.50

Southwest Research Inst., San Antonio, Tex.
A NOTE ON THE EFFECTIVENESS OF TWO TYPES OF SLOSH SUPPRESSION DEVICES,
by H. Norman Abramson and Guido E. Ransleben, Jr.
15 Jun 59, 20p Technical rept. no. TR-6
Contract DA23 072ORD1251
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Sloshing, Damping), Tanks (Containers), Fuel tanks, Propellant tanks, Models (Simulations), Simulation, Cylindrical bodies, Rings, Effectiveness.

Some measurements obtained during sloshing experiments with rigid model cylindrical tanks in translation, and containing two different types of mechanical suppression devices, are presented and discussed. (Author)

AD-613 707 Div. 9, 12
CFSTI Prices: HC$2.00 MF$0.50

Southwest Research Inst., San Antonio, Tex. Dept. of Mechanical Sciences.
LIQUID SLOSHING IN RIGID CYLINDRICAL TANKS UNDER-GOING PITCHING MOTION,
by H. Norman Abramson and Guido E. Ransleben, Jr.
1 May 61, 31p Technical rept. no. TR-11
Contract DA23 0720RD1251, Proj. 43 768 2
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
Copy is available for public sale.

Descriptors: (*Propellant tanks, Sloshing), (*Sloshing, Pitch (Motion)), Liquids, Stiffened cylinders, Rings, Center of gravity, Pressure, Graphics.

The paper is concerned primarily with a series of experiments involving sloshing in rigid cylindrical tanks excited in pitching about the liquid center of gravity, and thus is a continuation of the similar studies of tanks excited in translation.

AD-613 708 Div. 9
CFSTI Prices: HC$3.00 MF$0.75

Bell Aerosystems Co., Buffalo, N. Y.
NONLINEAR THERMOELASTIC EFFECTS ON HYPERSONIC STABILITY AND CONTROL. PART III: SIMULATION, MEASUREMENT AND ANALYSIS OF NONLINEAR STATIC AEROTHERMOELASTIC BEHAVIOR OF A 45 DEGREE DELTA WING.
Final rept.,
by James R. Batt. Feb 65, 57p
Contract AF33 657 7486, Proj. 8219, Task 821901
FDL TDR-64-16 P3 Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Aerothermoelasticity, Hypersonic flow), (*Delta wings, Aerothermoelasticity), Aerodynamic loading, Aerodynamic heating, Aerostatics, Lift,

Stability, Control, Model tests, Simulation, Analysis, Iterative methods, Measurement, Programming (Computers).

Results are presented of additional nonlinear structural-aerodynamic interaction experiments and analyses conducted on a 45 degree delta wing. The aeroelastic simulation scheme developed and described in AD-608 476 was used to experimentally determine the static aerothermoelastic behavior of the subject model wing. Test data were compared with theoretical predictions using a digital computer program. (Author)

AD-613 709 Div. 9, 12
CFSTI Prices: HC$1.00 MF$0.50

Southwest Research Inst., San Antonio, Tex. Dept. of Mechanical Sciences.
THEORETICAL AND EXPERIMENTAL STUDIES OF LIQUID SLOSHING IN RIGID CYLINDRICAL TANKS.
Final rept. for 20 Mar 58-1 May 61,
by H. Norman Abramson. 15 May 61, 18p
Contract DA23 072ORD1251, Proj. 43 768 2
Unclassified report

Descriptors: (*Propellant tanks, Sloshing), (*Sloshing, Liquid rocket propellants), Cylindrical bodies, Stiffened cylinders, Pitch (Motion), Models (Simulations), Simulation, Theory, Effectiveness, Reviews.

A summary report of previous related studies.

AD-613 710 Div. 9, 30

Harry Diamond Labs., Washington, D. C.
FLUID LOGIC ELEMENTS,
by R. W. Warren. 1964, 61p
Unclassified report

Available only for reference use at DDC field services.
Copy is available for public sale.

Descriptors: (*Amplifiers, Fluid flow), (*Computer logic, Fluid flow), (*Fluid flow, Computer logic), Digital systems, Control systems, Counting methods, Jets, Nozzles, Pressure, Pulse amplifiers, Binary arithmetic.

There are several fluid amplification techniques that can be used in logic systems. This discussion is concerned with fluid elements using the technique of attaching a stream to a wall. In designing logic systems from such elements, there are two methods of connecting the elements to accommodate the flow. These are sometimes called the closed system and the bleed system. In the closed system, the successive elements are made larger and larger to accommodate all the flow of the previous stages. This type of system is employed for multistage flow and pressure amplifiers. All the fluid supplied at the inputs is available at the output for efficient use of power. Because the size of each unit must be adjusted to that of the preceding one, such a design is not practical for the more complex logic systems. When the bleed method is adapted to logic systems, it is desirable from the standpoint of simplicity that the fluid elements have the following characteristics: (1) same size, (2) same pressure source, and (3) equal pressure drop across nozzle; i.e., equal flow. (Extracted)

AD-613 711 Div. 9, 30
CFSTI Prices: HC$1.00 MF$0.50

Harry Diamond Labs., Washington, D. C.
INSTRUMENTATION,
by Kenneth R. Scudder. 1963, 24p
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
Copy is available for public sale.

Descriptors: (*Instrumentation, Fluid flow), (*Fluid flow, Amplifiers), (*Amplifiers, Fluid flow), (*Meters, Fluid flow), Measurement, Pressure, Velocity, Manometers, Flowmeters, Pressure gages, Transducers, Venturi tubes, Pitot tubes, Anemometers, Recording systems, Calibration.

The paper reviews the various types of instrumentation and the tools useful in measuring and detecting the phenomena occurring in fluid amplification devices. Topics include: pressure measurement, flow-velocity measurements, frequency measurement, recording and calibration.

AD-613 712 Div. 9, 30

Harry Diamond Labs., Washington, D. C.
SOME SPECIAL CIRCUITRY,
by Kenneth R. Scudder. 1964, 26p
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Amplifiers, Fluid flow), (*Fluid flow, Amplifiers), Digital systems, Control systems, Jets, Computer logic, Counting systems, Coanda effect, Heat.

There are a number of interesting applications or devices where fluid elements or fluid circuits with no (or almost no) moving parts are used. Some of these applications or devices not covered elsewhere are discussed in order to give a general idea of the range of application of the fluid amplification techniques, along with some approaches for solving certain fluid problems. The development of special fluid circuitry for fluid logic devices and fluid computing functions is dealt with in some detail. The objectives sought with fluid interaction devices are: to simplify the equipment, to make the entire system compatible throughout, to increase reliability, to reduce cost, to reduce the device susceptibility to the environment such as radiation, temperature, shock, vibration, etc., to facilitate fabrication, to avoid wear, to take advantage of an economical working media, or any number of other special reasons.

AD-613 728 Div. 9

Iowa Inst. of Hydraulic Research, Iowa City.
THE APPLICATION OF THE BERNOULLI THEOREM IN ZONES OF SEPARATION (l'Application du Theoreme de Bernoulli dans les Zones de Decollement),
by R. Chevray. 1964, 14p
Contract Nonr150903; Grant DA ARO D2871E
Unclassified report

Pub. in la Houille Blanche (France) n6 p671-84 1964 (Copies available only to DDC users).

Descriptors: (*Fluid flow, Separation), Turbulence, Shear stresses, Vortices, Diffusion, Partial differential equations.

The thesis illustrates a typical case of separation at an abrupt change in boundary geometry (i.e., at the edge of circular disk, at the edge of the wall, and at the beginning of the abrupt expansion). Without separation the streamline at the edge should have an infinite curvature accompanied by an infinite pressure gradient. This unrealistic situation leads to the conclusion that separation must occur. As a matter of fact, if the radius of curvature of the limiting streamline is small, as in the case of the disk or of the wall, the initial separation point will possess a low pressure.

AD-613 732 Div. 9

Princeton Univ., N. J.
ROTATIONAL STAGNATION POINT FLOW,
by Wallace D. Hayes. 13 Jan 64, 10p
Contract AF49 638 1271
AFOSR 65-0555
Unclassified report

Pub. in Journal of Fluid Mechanics (Gt. Brit.) v19 pt3 p366-74 1964 (Copies available only to DDC users).

Descriptors: (*Stagnation point, Vortices), (*Vortices, Stagnation point), Boundary layer, Three-dimensional flow, Gas flow, Equations, Matrix algebra.

The constant-density inviscid rotational flow in the neighbourhood of a general stagnation point on a wall is investigated. In all but very special cases, the solution is non-analytic and the vorticity at the wall is infinite; the stagnation streamline is tangent to the wall at the stagnation point; stagnation points of saddlepoint type cannot exist. The boundary-layer equations corresponding to the inviscid solutions studied are presented. (Author)

AD-613 747 Div. 9

Royal Coll. of Science and Technology, Glasgow (Scotland).
A FLOW PATTERN AT HIGH SUBSONIC SPEEDS PAST A WEDGE AT INCIDENCE IN A FREE STREAM AND A CHOKED CHANNEL,
by J. B. Helliwell. 10 Oct 60, 23p
Technical note no. TN-2
Contracts AF61 052 407, AF61 514 1170
AFOSR 2213
Unclassified report

Pub. in Journal of Mathematics and Physics (U. S.) v40 n1 p1-22 Apr 1961 (Copies available only to DDC users).

Descriptors: (*Subsonic flow, Aerodynamic configurations), (*Wedges, Subsonic flow), Transonic flow, Two-dimensional flow, Boundary value problems, Integral equations, Theory, Mathematical analysis.

In the paper it is shown that the type of free stream singularity in the hodograph plane has an essentially different character from that at zero angle of attack, as a consequence of which the wedge profile is somewhat distorted and a 'perturbation' type of analysis is unsuitable. In the present paper, using a formulation in terms of dual integral equations, an investigation is made of the model previously studied by Willmarth. An extension of the model is also made to the case of the flow past a wedge profile at a small angle of attack in a channel with parallel walls such that the sonic lines from the shoulders extend normally to and completely across the channel to choke the flow, and the restrictive effect of the channel walls is determined. The boundary value problem is formulated in general terms for a flow

in an unchoked channel with different high subsonic velocities far upstream and downstream. The analyses for the flow in a free stream or a choked channel then follow as two special cases of this general statement. They will be discussed in Part I and Part II respectively of the paper. In the former it will be found that the integral equations degenerate to give a simple solution; in the latter a full solution is obtained by means of an iterative procedure.

AD-613 758 Div. 9

Massachusetts Inst. of Tech., Cambridge.
THE NUMBER OF UNSTABLE MODES IN HYDRODYNAMIC STABILITY PROBLEMS,
by Louis N. Howard. 12 Jun 64, 12p
Unclassified report

Pub. in Journal de Mecanique (France) v3 n4 p433-43 Dec 1964 (Copies available only to DDC users)
Partially supported by ONR.

Descriptors: (*Hydrodynamics, Stability), Incompressible flow, Two-dimensional flow, Perturbation theory.

It is shown that for an important class of velocity profiles the number of unstable modes cannot exceed the number of inflexion points. The ranges of unstable wave numbers for the various modes are also delimited. (Author)

AD-613 790 Div. 9

Institute for Fluid Dynamics and Applied Mathematics, Univ. of Maryland, College Park.
STREAKLINES IN A PERTURBED SHEAR FLOW.
Revised ed.,
by Francis R. Hama. 23 Feb 62, 7p
Contract AF49 638 645
AFOSR 1795
Unclassified report

Pub. in Physics of Fluids (U. S.) v5 n6 p644-50 Jun 1962 (Copies not available to DDC or Clearinghouse customers).
Revision of Manuscript submitted 30 Nov 61.

Descriptors: (*Flow visualization, Reliability), Shear stresses, Wave transmission, Vortices, Perturbation theory, Damping, Motion, Particles, Boundary layer, Wire, Dyes.

Streaklines are numerically obtained for a shear flow perturbed by an unamplifying traveling sinusoidal wave. It is shown that, if a dye is injected from near the critical layer, the streaklines have an appearance of amplification and rolling as if to indicate that the flow develops into discrete vortices. The rolling-up of a streakline cannot therefore constitute a positive identification of the presence of discrete vortices. Away from the critical layer, on the other hand, the streakline appears to show an alternating amplification and damping. Apparent wavelength and wave velocity are both incorrect except in the critical layer. Further, any information due to pathlines or obtained by tracing marked particles is equally improper in regard to the wave motion. These results strongly suggest that a great deal of caution must be exercised in interpreting flow phenomena based upon flow-visualization techniques. (Author)

AD-613 849 Div. 9

Iowa Inst. of Hydraulic Research, Iowa City.
ESTABLISHMENT OF THE WAKE BEHIND A DISK,
by Thomas Carmody. 13 Feb 64, 14p
Reprint no. 197
Contract Nonr150903; Grant DA ARO D2871E
Unclassified report

Pub. in Journal of Basic Engineering (U. S.) p869-82 Dec 1964 (Copies not available to DDC or Clearinghouse customers).
ASME Paper no. 64-FE-3
Rept. presented at the Fluids Engineering Conference, Philadelphia, Pa., 18-21 May 64.

Descriptors: (*Wake, Turbulence), (*Disks, Wake), Shear stresses, Turbulent boundary layer, Fluid dynamic properties, Separation, Wind tunnels, Graphics.

An air-tunnel study of the establishment of the wake behind a disk at a Reynolds number of approximately 70,000 was undertaken. On the basis of the measured data, such a wake is fully established, that is, similarity profiles of the flow characteristics are formed, within 15 diameters of the disk, and approximately 95 percent of the transfer of energy from the mean motion to the turbulence motion takes place within 3 diameters of the disk, in the region of the mean standing eddy. The measured mean ambient-pressure and mean total-pressure distributions, mean velocity distributions, turbulence-intensity and shear-stress distributions, and the mean streamline pattern are presented. A stream function consisting of a continuous distribution of doublets is introduced to extend the radial limit of understanding of the flow characteristics to a very large if not infinite radius. Considerable attention is given to the problem of obtaining and interpreting turbulence shear-stress data immediately downstream from the point of flow separation. The applicability of a local diffusion coefficient or virtual viscosity of the Boussinesq or Prandtl type for relating the turbulence shear stress to the radial gradient of mean axial velocity is discussed. (Author)

10. Fuels and Combustion

AD-613 449 Div. 10, 14
CFSTI Prices: HC$8.95 MF$2.75

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
OIL PRODUCTS AND PRODUCTS OF PROCESSING SOLID FUELS (STATE STANDARDS).
12 Mar 65, 592p FTD-MT-64-235
TT 65-61940

Unclassified report

Edited machine trans. of mono. Nefteprodukty i Produkty Pererabotki Tverdykh Topliv, Tekhnicheskie Trebovaniya, Moscow, 1963, 527p.

Descriptors: (*Petroleum, Standards), (*USSR, Petroleum), Specification, Petroleum industry, Handbooks.

Contents: Gas fuels, carburetor fuel, diesel fuel, boiler fuel, fuel for motors of various assignments, motor oils, industrial oils, oils-turbine, compressor and for steam machines, oils-transmissional and for coarse mechanisms, mineral oils of various assignments, consistent lubricants, solvents, paraffin-ceresin-vaseline and wax compositions, petroleum bitumen, products of pyrolysis, petroleum acids and their salts, illuminating oil products, other oil products, components and additives to fuels-oils-and lubricants.

AD-613 553 Div. 10, 14, 17
CFSTI Prices: HC$2.00 MF$0.50

Defense Metals Information Center, Columbus, Ohio.
COMPATIBILITY OF MATERIALS WITH ROCKET PROPELLANTS AND OXIDIZERS,
by W. K. Boyd, W. E. Berry, and E. L. White.
29 Jan 65, 46p DMIC Memo. no. M-201
Contract AF33 615 1121, Proj. 8975

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Liquid rocket propellants, Compatibility), (*Liquid rocket oxidizers, Compatibility), Ammonia, Boranes, Fluorine compounds, Hydrazine derivatives, Hydrogen, Hydrogen peroxide, Halogenated hydrocarbons, Chlorine compounds, Nitric acid, Nitrogen compounds, Oxides, Oxygen, Ozone, Solid rocket propellants, Corrosion, Storage.

The memorandum summarizes the available information on the compatibility of liquid rocket propellants with prominent materials of construction. Fuels and oxidizers of current interest are discussed. The corrosion data which are presented will apply to storing, handling, and control equipment outside of missiles and to missile components excluding combustion chamber. The compatibility of materials with reaction products in combustion chambers, nozzles, etc., is not considered. Included in the summary are data for many nonmetallic materials. The memorandum is subdivided into sections according to the propellant. Each material of construction is rated for a given medium as belonging to one of four classes, based primarily upon corrosion resistance. Consideration also is given to such factors as catalytic decomposition and sensitivity to impact.

11. Ground Transportation Equipment

AD-613 166 Div. 11, 30

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PROJECT OTTER (OVERLAND TRAIN TERRAIN EVALUATION RESEARCH).
Test rept.,
by John H. Shamburger and Leiland M. Duke. Feb 65, 73p Technical rept. no. TR-3-588; R-2
Proj. 1V0 25001A131

Unclassified report

Available from U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi for $1.25.
Also see AD-402 257.

Descriptors: (*Cargo vehicles, Desert tests), (*Towing vehicles, Cargo vehicles), Armed forces transportation, Mapping, Maps, Geography, Deserts, Terrain, Environmental tests, Data, Recording systems, Fuel consumption, Velocity, Army equipment.

A program designed to test objectively and evaluate quantitatively the cross-country mobility of the Overland Train (a logistical cargo carrier) in a desert environment was conducted over selected courses at the U. S. Army Yuma Proving Ground. The following data were collected within each terrain type occurring along the courses tested: fuel consumption, electrical energy required to operate the driving, traction, and steering systems, distance traveled, dust density, and acceleration at specific points on the train. These data were recorded on two 8-channel oscillographs, and were compared with 'base values' obtained during operation over a level paved road to determine the cause-effect relation of terrain factors on cross-country operation of the Overland Train. Effects of terrain on cross-country operation were decrease in speed, increase in path length, and increase in fuel consumption. These effects were attributed to microgeometry features and the direction of travel across these features. Quantitative relations between speed and fuel consumption were established for the terrain types tested. Terrain types along the two courses traversed are compared to the terrain of world deserts of North Africa, the Middle East, and South Central Asia.

12. Guided Missiles

AD-613 279 Div. 12, 30
CFSTI Prices: HC$4.00 MF$1.00

Aeronutronic, Newport Beach, Calif.
SPIRAL DECAY AND SENSOR CALIBRATION DIFFERENTIAL CORRECTION PROGRAMS. VOLUME I. PROGRAM DEVELOPMENT,
by T. G. Gaa, C. G. Hilton, P. A. VanderStucken, and L. G. Walters. 31 Jan 65, 125p
Pub. U-3005
Contract AF19 628 3377
ESD TDR-65-76

Unclassified report

Descriptors: (*Orbital trajectories, Programming (Computers)), (*Astronautics, Programming (Computers)), (*Programming (Computers), Astronautics), Celestial mechanics, Atmosphere entry, Descent trajectories, Mathematical prediction, Satellites (Artificial), Position finding.

This document presents the theory, operation, and coding details of and experience with a computer program for the accurate prediction of the reentry corridor of an earth satellite undergoing orbital decay due to atmospheric friction. This program is also useful in the precision prediction of satellite positions for other purposes such as sensor calibration and weapon systems. (Author)

AD-613 280 Div. 12, 30
CFSTI Prices: HC$2.00 MF$0.50

Aeronutronic, Newport Beach, Calif.
SPIRAL DECAY AND SENSOR CALIBRATION DIFFERENTIAL CORRECTION PROGRAMS. VOLUME II. OPERATING INSTRUCTIONS,
by T. G. Gaa, C. G. Hilton, P. A. VanderStucken, and L. G. Walters. 19 Feb 65, 48p
Pub. no. U-3006
Contract AF19 628 3377
ESD TDR-65-76

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
Copy is available for public sale.
See also AD-613 279.

Descriptors: (*Programming (Computers), Astronautics), (*Astronautics, Programming (Computers)), Orbital trajectories, Life expectancy, Mathematical predictions, Data processing systems, Input-output devices, Instruction manuals, Satellites (Artificial), Position finding.

This volume contains instructions which enable a non-programmer to use the Spiral Decay Program (SPIRDECA) under the control of the B-3 executive on the Philco 212 computer. The program was designed for use in the SPACETRACK center of NORAD.

AD-613 294 Div. 12, 30
CFSTI Prices: HC$6.00 MF$1.50

Aeronutronic, Newport Beach, Calif.
SPIRAL DECAY AND SENSOR CALIBRATION DIFFERENTIAL CORRECTION PROGRAMS. VOLUME III. PROGRAMMER'S MANUAL,
by T. G. Gaa, C. G. Hilton, P. A. VanderStucken, and L. G. Walters. Feb 65, 256p Rept. no. U-3007
Contract AF19 628 3377
ESD TDR-65-76

Unclassified report

See also AD-613 280.

Descriptors: (*Programming (Computers), Astronautics), (*Astronautics, Programming (Computers)), Orbital trajectories, Life expectancy, Mathematical prediction, Data processing systems, Compilers, Programmers, Instruction manuals, Satellites (Artificial), Position finding.

This document describes, from a programmer's view, the coding function, and logic of the Spiral Decay computer program. The Spiral Decoy program operates in the SPACETRACK B-3 Semi-Automatic Programming System; and will accept sensor observations, assign weights and biases to the data, perform a differential correction and predict past or future position and velocity. Section 2 of this document contains a functional description and basic flow charts of the program. Section 3 defines symbolic names, data and tape formats, and memory assignments. A detailed description of each subroutine used by Spiral Decay is given in Section 4. The Appendix describes the Adams-Bashforth integration routine which is used by Spiral Decay for ephemeris integration. (Author)

AD-613 357 Div. 12, 15
CFSTI Prices: HC$3.00 MF$0.75

Massachusetts Inst. of Tech., Cambridge.
A VARIATIONAL CALCULUS SOLUTION TO THE OPTIMUM ORBITAL ESCAPE PROBLEM, AND COMPARISON WITH SEVERAL STEERING PROGRAMS OF SIMPLE ANALYTICAL FORM.
Master's thesis,
by Larry A. Baron. 26 Jun 61, 55p
Contract AF49 638 363 nclassified report
AFOSR 1008
Revision of rept. dated 16 Jan 61.

Descriptors: (*Orbital trajectories, Optimization), (*Calculus of variations, Space navigation), (*Satellites vehicles, Maneuverability), (*Space flight, Optimization), Thrust, Boundary value problems.

The calculus of variations is used to determine the power level, thrust magntiude, and steering program which will minimize the propellant necessary for a vehicle to effect an escape from an orbit around the Earth. The trajectory is shown to consist of a number of thrusting sub-arcs proportional to the value of the time constraint. If the time constraint is less than one revolution of the initial orbit, the trajectory consists of one thrusting-arc. For a thrust-limited vehicle it is shown on physical grounds that the thrusting-arc consists of maximum thrust. For a power-limited vehicle, the variational apparatus yields a maximum power, maximum specific impulse thrusting-arc. The optimum steering program determined numerically through the use of a digital computer, is found to begin slightly below the horizontal, and increases until the thrust direction is exactly aligned with the velocity vector at the terminal point. Several steering programs of a simple analytical form are also computed numerically for a comparison with the optimum program. (Author)

AD-613 596 Div. 12
CFSTI Prices: HC$2.00 MF$0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.

DERIVATIONS OF COEFFICIENTS RELATING ASCENT TRAJECTORY DISPERSIONS TO AGENA GUIDANCE AND PERFORMANCE VARIATIONS.
Technical rept.,
by J. M. Deerwester and A. E. McCaulou. Aug 60,
40p Rept. no. LMSD-703076
Contract AF04 647 592

Unclassified report

Descriptors: (*Staging, Errors), (*Ascent trajectories, Staging), (*Launch vehicles (Aerospace), Staging), Astronautics, Guidance, Propulsion, Launching, Parking orbit trajectories, Mathematical analysis.

Equations are derived which relate errors in vehicle performance parameters and guidance components to the trajectory variation at final-stage cutoff. Expressions are included for the propagation coefficients of the orbit parameters during the parking orbit. These coefficients relate errors in first-burn cutoff conditions to second-burn ignition conditions. A degree of generality is achieved by considering both a two-stage and a three-stage configuration. (Author)

AD-613 675 Div. 12, 12, 17, 26
CFSTI Prices: HC$2.00 MF$0.50

New Departure Div., General Motors Corp.,
Bristol, Conn.
INVESTIGATION OF HIGH TEMPERATURE BEARING ELEMENTS.
Progress rept. no. 2, 1 Apr-30 Jun 64,
by C. J. Zupkus, H. R. Ludwig, and A. R. Leveille.
1 Jul 64, 35p
Contract AF33 615 1208, Proj. 1315, Task 131501

Unclassified report

Descriptors: (*Test equipment, Bearings), (*Bearings, Materials), Ceramic materials, Loading (Mechanics), Test methods, Oxidation, Tests, Friction, Ball bearings, High-temperature research, Composite materials, Lubricants, Reentry vehicles, Intermetallic compounds.

The 2500F test rig was assembled and checked out for reliability. A technique of calibration was established which eliminates the need for individual calibration curves of strain beam reading versus force. Studies were conducted to determine the basis of interpreting oxidation behavior and rolling friction forces. The design of the sliding friction test specimen was established. (Author)

AD-613 714 Div. 12, 30
CFSTI Prices: HC$1.00 MF$0.50

Naval Weapons Lab., Dahlgren, Va.
A COMPUTER PROGRAM TO COMPUTE ORBITAL ELEMENTS FROM POSITION AND VELOCITY OR POSITION AND VELOCITY FROM ORBITAL ELEMENTS.
Supplement no. 2,
by Mary B. Palen. 7 Apr 65, 5p
Rept. no. K-37/64, suppl

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-602 832.

Descriptors: (*Programming (Computers), Orbital trajectories), (*Orbital trajectories, Programming (Computers)), Programming languages, Velocity, Tracking, Position finding, Satellites (Artificial).

13. Installations and Construction

AD-613 171 Div. 13

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
SOIL STABILIZATION. LABORATORY INVESTIGATION OF SOIL STABILIZING SYSTEMS FOR MILITARY PURPOSES,
by George R. Kozan and William B. Fenwick. Feb 65, 34p Technical rept. no. TR-3-455, R-7
Proj. 1T0 21701A046, Task 1T0 21701A046 05
Unclassified report

Available from U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi for $0.50.

Descriptors: (*Soil mechanics, Stabilization systems), (*Civil engineering, Soil mechanics), (*Stabilization systems, Soil mechanics), Military requirements, Soils, Trafficability, Additives, Cements, Calcium compounds, Oxides, Phosphoric acids, Sodium compounds, Silicates.

Four major stabilizer systems were studied in which the primary additives were (a) portland cement, (b) lime, (c) phosphoric acid, and (d) sodium silicate. Of the four systems evaluated, portland cement was the most generally effective, with 5% treatment by soil weight resulting in 24-hr humid-cure compressive strengths well above 100 psi (approximately equivalent to 20 CBR), which represents the maximum requirement for the designations of military roads and airfields under consideration. This treatment also provided very good resistance to strength loss on wetting. The use of secondary or modifying additives with cement was found to be either detrimental or beneficial to strength development or wetting resistance, or both, depending on the type of soil. While the combination of 4% quicklime plus 1% magnesium sulfate was highly effective on the basis of initial strength development, it was relatively poor in preventing strength loss on wetting. The results obtained with the phosphoric acid and sodium silicate formulations were not encouraging, and further investigations of these systems for military purposes are not warranted.

AD-613 266 Div. 13
CFSTI Prices: HC$1.00 MF$0.50

Army Cold Regions Research and Engineering Lab., Hanover, N. H.
PRODUCTION ANALYSIS OF CUT-AND-COVER TRENCH CONSTRUCTION,
by Gunars Abele. Aug 64, 21p
Technical rept. no. TR-126
Task 8S66 02 001
Unclassified report

Descriptors: (*Underground structures, Snow), Construction, Time studies, Earth-handling equipment, Snow vehicles, Analysis.

During the 1961 and 1962 summer test seasons at Camp Century, Greenland, a 1600-ft-long trench containing horizontal curves was constructed. A total of 105 hr 45 min of Peter-plow machine time was required for the cutting operation. The overall cutting production, including spoil cuts, was 466 cu yd/hr cu or 166 tons/hr of snow excavated. The trench-cut average was 359 yd cu/hr or 134 tons/hr. The trench-covering operation required an additional 16 Peter-plow-hr and a total of 290 man-hr for the arch installation, a rate of 5.5 ft of roof per man-hr, or, using a five-man crew, a rate of approximately 27.5 ft/hr. The arch removing required approximately 27% of the installation time. Fuel (diesel oil) consumption was at a rate of 14.9 tons of snow excavated per gallon of fuel, or approximately 2.2 ft of trench per gallon. The trench-floor processing (400-ft length) required 2 1/2 hr, a rate of 160 ft of floor per hr, and the leveling (1600-ft length) required 4 hr, a rate of 400 ft/hr. A total of 176 man-hr was required to install the electrical system and exhaust fans. The production factor for cutting a straight trench was between 1.3 and 1.4 times that of a curved trench. (Author)

AD-613 297 Div. 13, 25
CFSTI Prices: HC$4.00 MF$1.00

Illinois Univ., Urbana.
THE DEVELOPMENT OF A DISTRIBUTION PROCEDURE FOR THE ANALYSIS OF CONTINUOUS RECTANGULAR PLATES,
by A. Ang. May 59, 119p Structural Research Series No. SRS-176
Unclassified report

Rept. on Civil Engineering Studies.

Descriptors: (*Structural parts, Statistical analysis), (*Distribution theory, Rectangular bodies), Beams (Structural), Supports, Deflection, Concrete, Reinforcing materials, Numerical methods and procedures, Difference equations, Continuum mechanics.

The study is concerned with the development of a numerical procedure for the analysis of rectangular plates continuous in two directions over flexurally and torsionally stiff beams and rigid columns of rectangular cross-sections. A reinforced concrete multiple-panel floor slab would be typical of such a structure. However, the analysis does not deal with such problems as inelastic action, creep, and moment redistribution, which are inherent in a reinforced concrete slab. The procedure is such that it is perhaps most useful in research application and certainly is not intended for direct use as a routine design procedure. The application of the method, however, is not limited to the analysis of reinforced concrete floor slabs. It can be extended to cover other fields where continuous plates are used as structural elements.

AD-613 323 Div. 13
CFSTI Prices: HC$3.00 MF$0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
MINIMUM-WEIGHT ANALYSES FOR HONEYCOMB SANDWICH PLATES AND SHELLS.
Technical rept.,
by A. Bruce Burns. Jul 64, 58p
Rept. no. 2-60-64-31
Contract NOw63 0050
Unclassified report

Descriptors: (*Structural parts, Honeycomb cores), (*Honeycomb cores, Sandwich construction), Cylindrical bodies, Structural shells, Sheets, Conical bodies, Hydrostatic pressure, Weight, Elasticity, Loading (Mechanics), Stability, Analysis, Shear, Compressive properties, Shear stresses.

Minimum-weight analyses and resultant design data are presented for flat plates subjected to edgewise compression, in-plane shear, or normal pressure, for circular cylinders subjected to uniform, external hydrostatic pressure, and for circular cones subjected to uniform, external hydrostatic pressure. Comparisons are made with the results of previous minimum-weight analyses for other constructions. In all comparisons, the potential minimum structural weight of honeycomb-sandwich construction is shown to be considerably less than the minimum structural weight of other constructions under elastic stress conditions. In minimum-weight honeycomb-sandwich construction, elastic stress conditions are shown to be present only

at very low loading indexes for most structural materials. Thus, for the majority of practical designs, minimum-weight honeycomb-sandwich facings are stressed to the maximum permissible stress. At high loading indexes where both minimum-weight conventional and honeycomb-sandwich constructions are stressed to the maximum permissible stress, conventional construction is more efficient due to the ineffectiveness of the honeycomb core in supporting the applied load directly. (Author)

AD-613 359 Div. 13, 18, 22
CFSTI Prices: HC$5.00 MF$1.25

United Research Services Corp., Burlingame, Calif.
PREDICTION MODELS FOR FIRE SPREAD FOLLOWING NUCLEAR ATTACKS.
Final rept.
Jan 65, 182p URS-641-6
Contract OCD-PS-64-48, Task 4611C
Unclassified report

Also include summary rept. by P. V. Phung and A. B. Willoughby.

Descriptors: (*Fires, Nuclear warfare), (*Nuclear warfare, Fires), Nuclear explosion damage, Nuclear weapons, Flames, Propagation, Mathematical prediction, Mathematical models, Fire safety, Civil defense systems.

In Part I a semiempirical approach is used to predict fire spread beyond the area directly ignited by thermal radiation from nuclear weapons. Mathematical models, both stochastic and deterministic, describe the progress of fires in two-dimensional or one-dimensional space. Application of each model to appropriate cases is discussed. Empirical data needed for evaluation of parameters are specified and methods for acquiring these data suggested. Observed data, accumulated over many years in records of past fires, have proved valuable in determining some of the parameters. The remaining parameters require further observed data. At present approximate prediction can be made by use of a specially designed version. Part II presents the results of a statistical study on observed rate of spread data and discusses a number of specific problems that must be worked out before the method can be used for assessing the fire damage from nuclear attacks. (Author)

AD-613 366 Div. 13, 11, 33

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
VICKSBURG MOBILITY EXERCISE A: VEHICLE ANALYSIS FOR REMOTE-AREA OPERATION.
Feb 65, 169p Miscellaneous paper no. MP-4-702
Unclassified report

Available from Waterways Experiment Station, $2.00.

Descriptors: (*Soils, Trafficability), (*Trafficability, Soils), (*Roads, Trafficability), (*Vehicles, Maneuverability), Armed forces operations, Soil mechanics, Tracked vehicles, Environmental tests.

The general purpose of the exercise was to consider quantitatively the various elements of the entire mobility problem and to suggest an approach to achieve a substantial degree of solution. The principal specific purpose was to design a number of vehicle test bed concepts that would be capable of operating in remote areas of the world where extremely soft-soil conditions predominate, and to develop a test program for these vehicles. Particular attention was paid in selecting soil strength criteria for which to design vehicles to the worldwide occurrence of soil conditions. Soil strength criteria of 10 rating cone index (RCI) for one pass with maneuvering an25 RCI for 50 straight-line passes were selected. Mainly on the basis of soil strength, but with obstacle performance also in mind, a number of vehicle design concepts were evolved to satisfy the basic assumptions. Of these, two wheeled vehicle concepts (an 8x8 and a 10x10) and one tracked vehicle concept were recommended for fabrication as test beds. A detailed plan of testing was written with emphasis on soft-soil performance but with the various elements of the total mobility problem also in mind.

AD-613 481 Div. 13
CFSTI Prices: HC$3.00 MF$0.75

New Mexico Univ., Albuquerque. Air Force Shock Tube Facility.
EXPERIMENTAL STUDY OF ARCHING STRESSES ON BURIED VERTICAL CYLINGDERS,
by George E. Triandafilidis, Delon Hampton, and Milan Spanovich. Dec 64, 76p
Contracts AF29 601 6002, AF29 601 4520,
Proj. 5710
WL TDR-63-3106
Unclassified report

Descriptors: (*Soil mechanics, Underground structures), (*Underground structures, Soil mechanics), (*Civil engineering, Underground structures), Engineering geology, Cylindrical bodies, Sand, Loading (Mechanics), Stresses, Statics, Experimental data, Graphics.

This report describes the first phase of a sustained research effort to study arching stresses on buried structures caused by modulus mismatch between structure and surrounding medium. A series of duplicate tests was performed on cylindrical and disc structures specially designed to separate arching stresses from side-wall frictional effects. All tests were static, using 20-30 dry Ottawa sand at three different densities. The applied over-pressure and the geometric configuration of the buried structures were varied to facilitate a study of the influence of these parameters on soil-structure interaction. (Author)

AD-613 545 Div. 13, 14, 18

Southwest Research Inst., San Antonio, Tex.
RESPONSE OF DEEP REINFORCED CONCRETE SLABS.
Rept. for Jul 62-Apr 64,
by R. K. Gregory, R. C. DeHart, and W. J. Austin.
Feb 65, 153p
Contract AF29 601 5385, Proj. 5710, Task 13 157
WL TDR-64-54
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is not available for public sale.

Descriptors: (*Reinforced concrete, Loading (Mechanics)), (*Loading (Mechanics), Reinforced concrete), (*Underground structures, Reinforced concrete), Shelters, Tests, Performance (Engineering), Statics, Structural parts.

The response of deep reinforced concrete slabs to uniformly distributed dynamic loads as high as 700 psi was measured and compared with the static behavior of companion slabs. Comparisons between theoretical and experimental results were made. Experience has shown that one of the major difficulties in predicting the static behavior of reinforced concrete slabs results from the

varying friction between the slab and bearing plate. The pressure seals and seal devices presented the primary experimental difficulty and made it impossible to yield the strongest slabs. (Author)

AD-613 550 Div. 13
CFSTI Prices: HC$1.00 MF$0.50

Naval Civil Engineering Lab., Port Hueneme, Calif.
GRAVITY VENTILATION OF UNDERGROUND SHELTERS.
Final rept. for Sep 63-Jun 64,
by J. C. King. Mar 65, 20p Technical rept. no. R-367
Proj. Y F011 05 02 340
Unclassified report

Descriptors: (*Shelters, Underground structures), (*Underground structures, Ventilation), (*Ventilation, Gravity), Gas flow, Air, Simulation, Wind, Pressure, Temperature.

Tests were conducted to determine the suitability of using gravity ventilation as an emergency method of providing air for survival in an underground shelter. The tests consisted of inducing through a simulated test shelter an airflow caused by (a) inside - outside temperature differentials, and (b) stack heaters in the exhaust duct. An additional test was made which involved a device to direct wind into the intake duct. It was found that wind blowing over the inlet and exhaust ducts created a negative pressure in the shelter that could not be satisfactorily overcome by the gravity methods used; thus, minimum ventilation rates could be obtained only when there was no wind blowing. In the tests conducted to utilize the wind, an NCEL-designed air inducer which mounts on the inlet duct provided satisfactory ventilation during normal weather conditions when there was a wind of 6 to 8 miles per hour. (Author)

AD-613 572 Div. 13, 4
CFSTI Prices: HC$3.00 MF$0.75

Naval Civil Engineering Lab., Port Hueneme, Calif.
THIN-FILM EVAPORATION IN VAPOR-COMPRESSION STILLS,
by E. J. Beck. Apr 65, 53p
Technical rept. no. R-364
Proj. Y-R011-01-01-022
Unclassified report

Descriptors: (*Sea water, Distillation), (*Films, Evaporation), Heat transfer, Evaporators, Boiling, Vapors, Condensation, Distilling plants.

A study is made to explore promising mechanisms of heat transfer which may be used to develop more efficient sea-water distillation units. As a basis of investigation, an extensive research survey of low-temperature-difference boiling heat transfer is briefly summarized, with the conclusion that with the present understanding of ebullition there is little prospect of achieving the desired heat transfer with active boiling. The metal-to-fluid superheat necessary to form a steam bubble with known types and sizes of nucleation sites prevents ebullition except with minimum temperature differences of 8 to 10F between the temperature of the metal wall and the saturation temperature of the fluid. The concept of evaporation from a very thin film without boiling is considered in detail, and two small experiments are reported. It is shown, both theoretically and experimentally, that very high evaporation rates can be obtained with the very thin film technique; methods of maintaining a thin film continuously in a practical vapor-compression still are considered. A single-tube experiment, in which methods of introducing feed water and checking probable scaling problems will be studied, is described as the next phase of this task. (Author)

AD-613 573 Div. 13, 32
CFSTI Prices: HC$1.00 MF$0.50

Federal Fire Council, Washington, D. C.
FORCIBLE ENTRY PRACTICES INVOLVING FEDERAL PROPERTIES.
Feb 65, 14p
Unclassified report

Descriptors: (*Fire safety, United States Government), (*Buildings, Fire safety), Law, Fires, Civilian personnel, Behavior.

A survey was made of the forcible entry practices of the various Federal agencies. The answers to the query indicate there is an expressed or implied permission for authorized fire department personnel to force entry into Federal premises to control or prevent spread of fire, except when areas are under special security restrictions. Security locations are either attended 24 hours a day or have instructions posted and, therefore, present no forcible entry problems.

AD-613 673 Div. 13, 1
CFSTI Prices: HC$1.00 MF$0.50

Boeing Scientific Research Labs., Seattle, Wash.
THE VIBRATION OF A TIGHT CABLE CONTAINING A TURNBUCKLE,
by F. Edwards Ehlers. Mar 65, 25p
Mathematical note no. MN-397, D1-82-0418
Unclassified report

Also available from the author.

Descriptors: (*Cables (Mechanical), Vibration), Positioning devices (Machinery), Analysis of variance, Partial differential equations, Integral transforms, Functions, Identities, Moments, Aircraft control cables, Configuration, Boundary layer.

The partial differential equations for the vibration of a cable containing a turnbuckle are solved by the method of the Laplace transformation and also by separation of variables. Since the turnbuckle renders the boundary conditions inhomogeneous, the eigenfunctions are not orthogonal in the classical sense, and a special scalar product is defined to make them orthogonal. The solution by separation of variables is simpler in form than the Laplace transform result for this particular problem and is shown by the use of identities in the eigenfunctions to yield the identical expansions as the Laplace transform method. The results simplify considerably when the turnbuckle is located in the center of the cable or at one end. The properties of these special cases are discussed. (Author)

14. Materials (Non-Metallic)

AD-613 159 Div. 14, 26
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
LUBRICATION FOR THE HOT ROLLING OF STEEL PIPE,
by P. I. Chuiko, M. S. Goncharevskii, and E. I. Tsygantsk. 18 Mar 65, 5p FTD-TT-64-1086
TT 65-61856

Unclassified report

Unedited rough draft trans. of Russian patent 161857, appl. 834359/23-4, 3 May 63.

Descriptors: (*Lubricants, Rolling (Metallurgy)), (*Rolling (Metallurgy), Lubricants), (*Steel, Rolling (Metallurgy)), Sodium compounds, Nitrates, Calcium compounds, Hydroxides, Graphite, Water, Colloids, Lubrication, Pipes, USSR.

The object of the invention is lubrication for the hot rolling of steel pipe in the temperature range of 300 to 500C using a watery suspension of graphite Chile saltpeter, and hydroxide of calcium which is introduced in the proportion of 10% by weight.

AD-613 175 Div. 14, 4
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF OBTAINING MULTIFUNCTIONAL ADDITIVES TO LUBRICATING OILS,
by A. I. Kartashevskii and E. S. Tetel'baum.
18 Mar 65, 4p FTD-TT-64-1087
TT 65-61864

Unclassified report

Unedited rough draft trans. of Russian patent 160251, appl. 811718/23-4, 2 Jan 63.

Descriptors: (*Lubricant additives, Synthesis (Chemistry)), (*Oils, Lubricant additives), Lubricants, Antioxidants, Corrosion inhibition, Cleaning compounds, Organic sulfur compounds, Phosphorus compounds, Sulfides, Oxides, Alkenes, Barium compounds, Phenols, Patents, USSR.

The object of the invention is a method of obtaining multifunctional additives for lubricating oils. Products of the oxidation of paraffine were treated with pentasulfide of phosphorus with subsequent neutralization of the product obtained in the presence of alkylphenol compounds.

AD-613 178 Div. 14
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
SOLID MOLYBDENUM DISULFIDE LUBRICANT,
by E. I. Berniker. 18 Mar 65, 5p
FTD-TT-64-1148
TT 65-61865

Unclassified report

Unedited rough draft trans. of Mashinostroitel' (USSR) 1964, no. 2, p. 25.

Descriptors: (*Molybdenum compounds, Sulfides), (*Lubricants, Powders), Antioxidants, Crystal structure, Metals, Cutting tools, Stability, USSR.

A semitechnical review.

AD-613 296 Div. 14, 25

Lexington Labs., Cambridge, Mass.
EVALUATION OF VAPOR DEPOSITION GROWTH OF OXIDE SINGLE CRYSTALS FROM METAL HALIDES.
Quarterly technical rept. no. 2, 1 Aug-31 Oct 64,
by Philip S. Schaffer. 31 Oct 64, 24p
Contract Nonr457400, ARPA Order 306

Unclassified report

Available only for reference use at DDC Field Services.
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Descriptors: (*Sapphires, Crystal growth), (*Ruby, Crystal growth), (*Crystal growth, Vapor plating), (*Vapor plating, Crystal growth), Aluminum compounds, Oxides, Impurities, Chromium compounds, Halides, Vapor pressure, Furnaces, Crystal structure, Symmetry (Crystallography), Crystal lattice defects, Heat of activation, Single crystals.

Preliminary investigations to determine significant vapor growth parameters were completed. Growth rate, substrate orientation and temperature, reactant vapor velocity, total pressure and partial pressures of the reactant gases were shown to influence the kinetics of crystal growth from the vapor phase. A two-inch diameter, molybdenum-element, muffle furnace was completed, which will enable growth of oriented ruby and sapphire crystals at least one inch in diameter. An experimental activation energy of 3.25 ev was determined for the overall growth process. A mechanism other than gaseous diffusion appears to be dominant for this system. Laminar flow, in the growth zone, is indicated by a calculated Reynolds number of 13.5. Vapor grown ruby and sapphire crystals exhibited a dislocation density reduction of one to three orders of magnitude over the flame fusion substrates. It was observed that dislocation densities decreased with increasing thickness of vapor growth. (Author)

AD-613 304 Div. 14, 12, 25
CFSTI Prices: HC$1.00 MF$0.50

California Univ., Los Angeles. Dept. of Chemistry.
OPTICAL TRANSPARENCY AND RESISTANCE TO FLASH HEATING,
by W. F. Libby. 14 Jun 60, 2p
Contract AF49 638 901
AFOSR TN-60-662

Unclassified report

Descriptors: (*Heat-resistant plastics, Transparent panels), (*High-temperature research, Heat-resistant plastics), Paints, Optical properties, Thermal conductivity, Guided missiles (Surface-To-Surface), Nose cones.

The optical transparency and resistance of plastics to flash heating is discussed.

AD-613 345 Div. 14
CFSTI Prices: HC$3.00 MF$0.75

Western Co. of North America, Dallas, Tex. Research Div.

INVESTIGATION FOR THE USE OF ADDITIVES FOR THE REDUCTION OF PRESSURE LOSSES,
Final rept.,
by G. T. Pruitt and H. R. Crawford. 30 Jan 65, 67p
Contract DA23 072AMC309T

Unclassified report

Descriptors: (*Hydraulic fluids, Additives), Oils, Fluid flow, Friction, Turbulence, Pitot tubes, Pressure.

A study was made of the effect of some friction reducing additives MIL-H-5606A hydraulic fluid It was demonstrated that a friction reduction as high as 60% can be achieved. Two percent (wt) of the additive selected for extensive testing increased the apparent viscosity by a factor of about two and increased the density by about 0.2%. The base fluid was found to be slightly non-Newtonian (shear thinning). The addition of the additive made the fluid more non-Newtonian, as anticipated. Velocity profile data were taken within 0.01 inches of the wall. These data showed that the viscous sublayer for the treated fluid is three to ten times thicker than that for the base fluid, also the profiles for the treated fluid are more laminar than those of the base fluid. That is, the intensity of turbulence is reduced by the addition of the additive. Negative values of the pitot differential pressure were obtained very near the wall, in some cases. A deeper investigation might show this to be due to the development of elastic forces in the fluid. The additive can produce friction reduction in fairly viscous oils and should be tried in an Army hydraulic transmission system. (Author)

AD-613 350 Div. 14
CFSTI Prices: HC$3.00 MF$0.75

Pennsylvania State Univ., University Park. Dept of Ceramic Technology.
ANISOTROPY AND STRENGTH OF CERAMIC BODIES.
Progress rept. no. 9-12, 15 Oct 63-15 Oct 64,
by W. R. Buessem, H. A. McKinstry, and G. R. Barsch.
15 Oct 64, 61p
Contract Nonr65627

Unclassified report

See also AD-288 273.

Descriptors: (*Ceramic materials, Tensile properties), (*Anisotropy, Ceramic materials), (*Germanium, Ceramic materials), (*Magnesium compounds, Oxides), (*Silicon compounds, Dioxides), Single crystals, Crystal structure, Elasticity, Thermal expansion, Hydrostatic pressure, Sintering.

The effect of elastic and thermal expansion anisotropy on the strength of ceramic materials is being investigated using ceramic bodies prepared from compositions where one of the anisotropy factors is known to be a minimum. The second order elastic constants of solid solution systems are being measured to determine the effect of composition on elastic anisotropy. The third order elastic constants were successfully measured for fused silica, Ge and MgO. The study of the strength of the grain boundary in bicrystals of MgO is nearing its completion. A theory for calculating the mechanical strength of crystals was developed which makes use of the experimentally determined second and third order elastic constants. This makes possible a more realistic estimation of the maximum strength attainable. (Author)

AD-613 360 Div. 14, 4
CFSTI Prices: HC$1.00 MF$0.50

Wyandotte Chemicals Corp., Mich.
SYNTHESIS OF LOW TEMPERATURE OIL RESISTANT URETHANE ELASTOMERS.
Quarterly progress rept. no. 8, 1 Dec 64-28 Feb 65,
28 Feb 65, 22p
Contract DA20 018ORD24883

Unclassified report

See also AD-607 284.

Descriptors: (*Elastomers, Synthesis (Chemistry)), (*Isocyanate plastics, Synthesis (Chemistry)), Oils, Aging (Materials), Catalysts, Alcohols, Ethers, Glycols, Nitriles, Halogenated hydrocarbons, Amines, Quinones, Plasticizers, Polyether plastics, Physical properties.

Pagination No. PR1665-0, containing a 14,000 molecular weight polyether triol, polytetramethylene ether glycol (2860 M.W.), trimethylol propane, dichlorobenzidine (DCB) and tolylene diisocyanate (TDI), was selected as a standard formulation. Variations were made in cure, catalyst, and excess TDI. Samples were also made substituting PLURACOL TP-340 for trimethylol propane, 2,6, dichloro-p-phenylene diamine and 2,3 dichloro-anthraquinone for DCB, bitolylene diisocyanate for TDI, and a polytrimethylene oxide glycol (1450 M.W.) for the polytetramethylene oxide glycol. (Author)

AD-613 361 Div. 14, 17, 26
CFSTI Prices: HC$0.50 MF$0.50

Naval Research Lab., Washington, D. C.
PROTECTIVE COATINGS FOR MAGNESIUM ALLOYS, PART I. EFFECT ON MECHANICAL PROPERTIES OF A NEW TECHNIQUE FOR FUSING TEFLON TO MAGNESIUM AND ALUMINUM ALLOYS.
Interim rept.,
by D. L. Venezky, A. G. Sands, and E. B. Simmons, Jr.
9 Mar 65, 18p Rept. no. NRL-6209
Proj. RRMA52 022 652 1R007 08 01

Unclassified report

Descriptors: (*Magnesium alloys, Plastic coatings), (*Aluminum alloys, Plastic coatings), (*Halocarbon plastics, Bonding), Protective treatments, Mechanical properties, Tensile properties, Zinc alloys, Heat treatment, Flame spraying, Corrosion inhibition.

Changes in the tensile and tensile yield strengths after fusing Teflon on magnesium alloy AZ31B-H24, and aluminum alloys 2024-T3, 5052-H32, and 6061-T6 have been studied. The new technique, a flame technique, for fusing Teflon caused less alteration of the mechanical properties than the frequently used 750F oven method; aluminum alloy 2024-T3 was affected less than the other alloys. The flame or concentrated source of heat is superior to the oven method of heating because the high temperatures used are such that a rapid fusion of the coating can be accomplished without heating the bulk metal to the fusion or decomposition temperature of the coating. The new technique appears applicable to other coatings and substrates, although the thermal conductivities and heat capacities of the substrate and coating must be considered when optimum flame-fusion conditions are sought. (Author)

AD-613 362 Div. 14, 22
CFSTI Prices: HC$0.50 MF$0.50

Rock Island Arsenal, Ill.
POLYURETHANE VULCANIZATES FOR TRACK PAD APPLICATION.
Technical rept.,
by W. M. Veroeven and J. W. McGarvey. 21 Dec 64,

18p Rept. no. 64-3579
Proj. 1D5-21801-D262
Unclassified report

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Descriptors: (*Elastomers, Mechanical properties), (*Isocyanate plastics, Mechanical properties), (*Heat-resistant plastics, Optimization), Vulcanizates, Polyester plastics, Polyether plastics, Stresses, Strain (Mechanics), Additives, Carbon black, Peroxides, Sulfur, Vehicle tracks, Tanks (Combat vehicles).

Several commercial millable gum polyester and polyether urethane elastomers were compounded for optimum stress-strain properties in the 75 to 400F. range. The effects of various types and amounts of carbon black, curatives and co-agents in peroxide and sulfur curable polymers were evaluated. Tank track pads were fabricated from promising compounds. Stress-strain properties at elevated temperatures were found to be dependent on the base polymer, and the amounts and types of curative and carbon black. Two millable polyester urethanes reinforced with SAF or ISAF black and cured with dicumyl peroxide, and a diisocyanate, were found to have the best ambient and high temperature stress-strain properties. (Author)

AD-613 368 Div. 14, 4, 31
CFSTI Prices: HC$1.00 MF$0.50

*Houghton (E. F.) and Co., Philadelphia, Pa.
DEVELOPMENT OF FIRE RESISTANT WATER BASED HYDRAULIC FLUIDS.
Final rept.,
by Philip Rakoff, G. John Colucci, and Robert K. Smith. 27 Mar 65, 20p
Contract NObs90269
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
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See also AD-610 379.

Descriptors: (*Hydraulic fluids, Flammability), (*Lubricants, Hydraulic fluids), Glycols, Water, Corrosion inhibition, Lubricant additives, Inhibition, Autoignition, Compatibility, Boron compounds, Phosphorus compounds, Chlorine compounds, Esters, Ethers, Aromatic compounds, Hydraulic pressure pumps, Benzoates, Tests.

Hydraulic fluids consisting of polyglycols, water and corrosion additives have been formulated whose properties meet or approach those proposed in the contract targets. The fire resistance characteristics of the finished lubricant were studied with inhibitors based on boron, phosphorus, or chlorine containing materials. Nitrogen and highly conjugated ring structures were incorporated into the major fluid components. Simulated hydraulic system tests have been used to establish the actual performance of the proposed hydraulic fluid base formulas. (Author)

AD-613 451 Div. 14, 4
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE ORIGIN OF THE PRODUCTS OF THE PYROLYSIS OF PHENOL-FORMALDEHYDE TAR,
by V. D. Moiseev, M. B. Neiman, and E. N. Raspopova. 24 Mar 65, 11p FTD-TT-64-997
TT 65-61942
Unclassified report

Unedited rough draft trans. of Plasticheskie Massy (USSR) 1960, no. 6, p. 11-13.

Descriptors: (*Phenolic plastics, Pyrolysis), (*Pyrolysis, Phenolic plastics), Tar, Graphite, Labeled substances, Methane, Carbon compounds, Monoxides, Formaldehyde, Molecular structure, USSR.

By the method of labelled atoms it was shown that, in the case of thermal degradation of phenol-formaldehyde resin, the greater part of the carbon of methylene cross links of the tar takes part in the formation of graphite (coke), and is not given off in the form of gas. By the same method it was shown that the gases which contain carbon in the degradation of the tar are formed not only from the cross-link methylene groups, but also from the aromatic rings, i.e., there occurs a disconnecting of some part of the rings. (Author)

AD-613 529 Div. 14, 4
CFSTI Prices: HC$2.00 MF$0.50

Institute of Rubber Research, Univ. of Akron, Ohio.
LOW TEMPERATURE POLYMERIZATION STUDIES.
Progress rept. no. 5, 1 Jan-31 Mar 65,
by Maurice Morton. 10 Apr 65, 30p
Contract AF04 611 9694, Proj. 3148
See also AD-610 038.
Unclassified report

Descriptors: (*Polymerization, Radiation chemistry), (*Radiation chemistry, Polymerization), (*Thermochemistry, Polymerization), Low-temperature research, Acrylonitrile polymers, Vinyl plastics, Halocarbon plastics, Aldehydes, Ketones, Nitriles, Copolymerization, Gamma rays, Bibliographies.

The report contains results on the polymerization or attempted polymerization of the following monomers by gamma radiation (7.6 rads/hr.) at reduced temperatures: acrylonitrile, hexafluoropropylene, fumaronitrile, hexafluoroacetone, trifluoroacetaldehyde, perfluorooctanal, and pentafluoropropionaldehyde. A comprehensive bibliography on the gamma irradiation of potential monomers was almost completed, and a preliminary listing is included. In addition, a Differential Thermal Analysis assembly was constructed for use during polymerization by gamma radiation of acrylonitrile. The results qualitatively indicate that polymerization occurs only in the temperature vicinity of a phase transition. (Author)

AD-613 549 Div. 14, 30
CFSTI Prices: HC$1.00 MF$0.50

Naval Civil Engineering Lab., Port Huene, Calif.
ELECTRICAL METHODS FOR PREDICTING PAINT PERFORMANCE. A LITERATURE SURVEY.
Interim rept.,
by Peter J. Hearst. 25 Mar 65, 16p
Technical note N-706
Proj. Y F015 06 06 902
See also AD-605 568.
Unclassified report

Descriptors: (*Paints, Performance (Engineering)), Test methods, Tests, Electricity, Reviews, Resistance (Electrical), Electrolytes, Direct current, Alternating current, Capacitance, Life expectancy, Quality control.

Conclusions: (1) It has been claimed that electrical measurements on coatings immersed in an electrolyte can be used to predict coating performance. (2) No published papers show detailed correlation of electrical measurements with exposure results for a large number of coatings and the validity of the methods has not been proven. (3) Further investigations of some of the electrical methods, including measurements of the dissipation factor, D. C. resistance, and capacitance, are needed to determine their validity as accelerated tests. (Author)

AD-613 561 Div. 14, 20
CFSTI Prices: HC$4.00 MF$1.00

General Dynamics/Fort Worth, Tex.
EFFECTS OF REACTOR RADIATION ON FIVE HIGH-TEMPERATURE SOLID-FILM LUBRICANTS.
Final rept. for 1 Oct 63-30 Sep 64,
by R. H. Daniel. Feb 65, 128p Rept. no. FZK-212
Contract AF29 601 6213, Proj. 6773, Task 677302
WL TR-64-158
Unclassified report

Descriptors: (*Lubricants, Radiation damage), (*Radiation damage, Lubricants), Gamma rays, Film, Coatings, Heat resistant materials, Life expectancy, Tests, High-temperature research, Nuclear reactors.

Nuclear reactor irradiation and laboratory testing were performed on five high-temperature solid-film lubricants (Midwest Research Institute, PbS + MoS2 + B2O3; NASA Lewis Research Center, CaF2 coating, Navy Aeronautical Materials Laboratory, MoS2 + graphite + sodium silicate; Almasol Corporation, Almasol SFD-810; and General Dynamics/Fort Worth, Dynalube). The specimens were exposed to an average gamma dose of 2.2 x 10 to 11th power ergs/gm(C) and associated neutrons of 5.2 x 10 to 16th power n/sq cm (E>2.9 Mev). The lubricants were applied by the developing agencies. Inconel-X was used as substrate material for all films; Timken standard test races were also used on the Midwest film. The Hohman A-6 wear tester was used for all wear-life measurements. Rub shoes were of Rex AAA; load, 110 lb per shoe; sliding speed, 128 ft/min; machine cutoff, automatic at mu = 0.4. Several test temperatures were investigated for each lubricant. Weibull plots and a ranking method were employed for data analysis. Reactor radiation had no significant effect on the wear life of the PbS + MoS2 + B2O3 or the CaF2 lubricants. However, detectable decreases in wear life were noted at 80F for Dynalube and at 900F for Almasol SFD-810. The wear life of MoS2 + graphite + sodium silicate suffered a decrease at 80F but improved at 600F and 1200F. (Author)

AD-613 576 Div. 14
CFSTI Prices: HC$2.00 MF$0.50

Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
CRACK EXTENSION IN FIBERGLASS REINFORCED PLASTICS,
by Edward M. Wu and R. C. Reuter, Jr. Feb 65, 32p Rept. no. T/AM-275
Contracts NOw64 0178d, NOw65 0204d
Unclassified report

Descriptors: (*Composite materials, Fracture (Mechanics)), (*Plastics, Glass textiles), (*Glass textiles, Reinforcing materials), Sheets, Filaments, Loading (Mechanics), Stresses, Mathematical analysis.

Experimental investigation on initially cracked Scotch-ply plates indicated that the fracture strength of this fiberglass reinforced plastics can be described by the laws of linear elastic fracture mechanics. The stress intensity factors, k sub 1c and k sub 2c, were constants for symmetric and skew-symmetric loadings. Furthermore, k sub 1 and k sub 2 were also found to be constants for various combinations of symmetric and skew-symmetric loadings. As indicated by photographs of the fractured specimens and the crack displacement time curves it was observed that although the cracks propagated along lines which were essentially straight, it is probable that the cracks made microscopic skips across the fiberglass reinforcement in the vicinity of this line in a discontinuous manner. This phenomena occurs more frequently when the specimens were subjected to shearing stress. At present, because the modes of crack extension under different type of loading are not fully understood, and also due to the mathematical difficulties involved in the calculation of maximum normal stress, maximum shear stress and maximum energy release rate, a general law of fracture applicable to all orthotropic materials cannot be formulated without further analytical and experimental investigations. An empirical equation was found which was an adequate representation for balsa wood as well as Scotch-ply and could represent a general fracture law for orthotropic materials. (Author)

AD-613 643 Div. 14
CFSTI Prices: HC$1.00 MF$0.50

Army Materials Research Agency, Watertown, Mass.
THE METALLOGRAPHY OF PYROLITIC GRAPHITE,
by Aram Tarpinian. Dec 64, 19p
Technical rept. AMRA-TR-64-41
Proj. 1A010501B010, Task 35183
Unclassified report

Descriptors: (*Pyrolitic graphite, Microstructure), Ion bombardment, Argon, Mercury, Chemical milling, Electrolytic polishing.

Etching of pyrolytic graphite by both argon ion bombardment and mercury ion bombardment is described. The difference between the microstructures revealed by the two methods is discussed, and an interpretation is suggested. Argon ion bombardment creates a leaf-like pattern reminiscent of stacked shingles. Mercury ion bombardment reveals a laminar structure unlike that produced by argon ion bombardment. Electrochemical polishing and etching reveals microstructures similar to those created by ion bombardment. Using an electrolyte based on phosphoric acid, microstructures similar to those resulting from mercury ion bombardment are revealed. Replacing the phosphoric acid with nitric acid results in microstructures similar to those obtained by argon ion bombardment. Based on the correlation between microstructures developed by ion bombardment and electrochemical etching, it is concluded that the microstructures revealed represent the true structure. (Author)

AD-613 676 Div. 14, 12, 17, 26
CFSTI Prices: HC$3.00 MF$0.75

New Departure Div., General Motors Corp., Bristol, Conn.
INVESTIGATION OF HIGH-TEMPERATURE BEARING ELEMENTS.
Progress rept. no. 3, 1 Jul-30 Sep 64,
by C. J. Zupkus, H. R. Ludwig, and A. R. Leveille.
30 Sep 64, 60p
Contract AF33 615 1208, Proj. 1315, Task 131501
Unclassified report

See also AD-613 675.

Descriptors: (*Bearings, Materials), (*Heat-resistant materials, Bearings), (*Ceramic materials, Bearings), High-temperature research, Test equipment, Composite materials, Silicon compounds, Carbides, Aluminum compounds, Zirconium compounds, Oxides, Zirconium alloys, Boron alloys, Molybdenum compounds, Silicides, Tantalum alloys, Beryllium alloys, Thorium alloys, Nickel alloys, Tungsten alloys, Chromium alloys, Friction, Tests, Lubricants, Reentry vehicles.

The Phase I, Part A requirement of screening eight materials has been completed. Test results have been analyzed for both the rolling and sliding specimen configurations and for the oxidation testing. The screening reduced the number of test materials to three in the Phase I, Part B testing. The testing program for Phase II has been established. (Author)

15. Mathematics

AD-613 238 Div. 15

Massachusetts Inst. of Tech., Cambridge.
WEIGHTED TRIGONOMETRICAL APPROXIMATION ON R(1) WITH APPLICATION TO THE GERM FIELD OF A STATIONARY GAUSSIAN PROCESS,
by N. Levinson and H. P. McKean, Jr.
13 Sep 63, 3p
Grant NSF GP149
Unclassified report

Pub. in American Mathematical Society. Bulletin (U. S.) v70 n1 p128-9 Jan 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Functional analysis, Trigonometry), (*Statistical processes, Functional analysis), Measure theory.

AD-613 244 Div. 15

Massachusetts Inst. of Tech., Cambridge.
ON THE MAXIMAL ERGODIC THEOREM FOR ABEL-LIMITS,
by Gian-Carlo Rota. 30 Jul 62, 3p
Grant NSF GP149
Unclassified report

Pub. in American Mathematical Society. Proceedings (U. S.) v14 n5 p722-3 Oct 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Measure theory, Operators (Mathematics)), (*Operators (Mathematics), Measure theory), Functional analysis, Groups (Mathematics).

The powerful and ingenious method of Chacon and Ornstein (Illinois J. Math. 4:153-160 (1960)), later simplified by E. Hopf (J. Math. Mech. 11:165-172 (1962)), has led to a proof of the ergodic theorem for general operators which is in many ways definitive. It is shown that if Abel convergence is used instead of Cesaro convergence, then a proof of the corresponding limit theorem is obtained which is of extreme simplicity. (Extracted)

AD-613 251 Div. 15

Northwestern Univ., Evanston, Ill.
OVERRINGS OF COMMUTATIVE RINGS. II. INTEGRALLY CLOSED OVERRINGS.
Doctoral thesis,
by Edward D. Davis. 25 Jun 62, 19p
Grant NSF G18916
Unclassified report

Pub. in American Mathematical Society. Transactions (U. S.) v110 n2 p196-212 Feb 1964 (Copies not available to DDC or Clearinghouse customers)
Prepared in cooperation with Yale Univ., New Haven.

Descriptors: (*Algebra, Groups (Mathematics)), (*Groups (Mathematics), Algebra), Topology, Theory, Algebraic geometry, Rings.

AD-613 256 Div. 15

Laboratory of Statistical Research, Univ. of Washington, Seattle.
COMBINATORIAL RESULTS IN MULTI-DIMENSIONAL FLUCTUATION THEORY,
by Charles Hobby and Ronald Pyke. 30 Jul 62, 4p
Contract Nonr47711; Grant NSF G19915, Proj. NR042 038
Unclassified report

Pub. in Annals of Mathematical Statistics (U. S.) v34 n2 p402-4 Jun 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Combinatorial analysis, Stochastic processes), (*Stochastic processes, Combinatorial analysis), Theorems, Real numbers, Sequences, Set theory.

AD-613 257 Div. 15

Mathematics Research Center, Univ. of Wisconsin, Madison.
SAMPLING PLANS WHICH APPROXIMATELY MINIMIZE THE MAXIMUM EXPECTED SAMPLE SIZE,
by Lionel Weiss and David Freeman. 1962, 22p
Contract DA11 022ORD2059, Grant NSF G22585
Unclassified report

Pub. in American Statistical Association. Journal (U. S.) v59 p67-88 Mar 1964(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Sampling, Statistical tests), (*Statistical tests, Sampling), Acceptability, Population (Mathematics), Sequential analysis, Operations research, Decision theory.

Conditions are given which must be met before the constructed sampling plan can satisfactorily minimize the maximum expected sample size of an indefinitely large population.

AD-613 258 Div. 15

Mathematics Research Center, Univ. of Wisconsin, Madison.
FOURIER TRANSFORMS OF CERTAIN CLASSES OF INTEGRABLE FUNCTIONS.
Revised ed.,
by Robert Ryan. 6 Oct 61, 12p
Contract DA11 022ORD2059, Grant NSF G14002
Unclassified report

Pub. in American Mathematical Society. Transactions (U. S.) v105 n1 p102-11 Oct 1962
(Copies not available to DDC or Clearinghouse customers)
Revision of rept. dated 11 Oct 60.
Prepared in cooperation with California Inst. of Tech., Pasadena.

Descriptors: (*Integral transforms, Functions), (*Functions, Integral transforms), Groups (Mathematics), Theorems, Measure theory, Functional analysis, Complex numbers.

AD-613 272 Div. 15, 30
CFSTI Prices: HC$2.00 MF$0.50

System Development Corp., Santa Monica, Calif.
MEAN VALUE ESTIMATION FROM DIGITAL COMPUTER SIMULATION,
by A. V. Gafarian and C. J. Ancker, Jr.
22 Mar 65, 45p Rept. no. SP-2005/000/00
Unclassified report

Descriptors: (*Systems engineering, Mathematical prediction), (*Stochastic processes, Analysis of variance), Probability, Sequential analysis, Queueing

theory, Complex variables, Digital computers, Simulation, Mathematical models.

Terminating and non-terminating stochastic processes are studied. If digital simulation is used, either a time-slicing or an event-sequencing technique may be used to obtain an estimate of some measure (mean value in our case) of system performance. We consider the variance of the estimate to be the basic measure for determining the goodness of the estimate. Three points are examined: (1) unbiasedness of the estimate, (2) efficiency of the estimate, and (3) variance reduction techniques. For the non-terminating case a large class of steady state processes having a negative exponential covariance function is studied and curves and specific examples are derived. Replication is shown to be generally superior to increasing the length of a run. For the terminating case, a general expression for efficiency is derived and again replication is shown to be the superior variance reduction technique. All results are equally valid for discrete or continuous processes. (Author)

AD-613 273 Div. 15, 26

Operations Research Center, Univ. of Calif., Berkeley.
NONPARAMETRIC LIFE TEST SAMPLING PLANS,
by Richard E. Barlow and Shanti S. Gupta.
30 Jul 64, 74p ORC-64-14 (RR)
Contract Nonr365618

Unclassified report

Prepared in cooperation with Applied Mathematics and Statistics Labs., Stanford Univ., Calif., Contract Nonr22553; Purdue Univ., Lafayette, Ind., Contract AF33 657 11737
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Descriptors: (*Sampling, Theory), (*Quality control, Decision theory), (*Statistical analysis, Reliability), Operations research, Life expectancy, Failure (Mechanics), Probability, Acceptability.

AD-613 329 Div. 15, 25, 1
CFSTI Prices: HC$1.00 MF$0.50

Institute for the Study of Fatigue and Reliability, Columbia Univ., New York.
ON GENERAL REPRESENTATION OF A DENSITY FUNCTION,
by M. Shinozuka and A. Nishimura. Feb 65, 23p
Technical rept. no. TR-14
Contract Nonr26691, Proj. NR064 470

Unclassified report

Descriptors: (*Statistical functions, Loading (Mechanics)), (*Structures, Failure (Mechanics)), Reliability, Probability, Series, Fatigue (Mechanics), Steel, Aluminum alloys, Stochastic processes, Power series.

To establish analytical forms of the density functions of the resistance of structures and of the applied load from samples of finite size for use in computing the probability of failure in the structural reliability analysis, the methods of the series expansion associated with the gamma distribution and of the asymptotic expansion are introduced while the two known methods, Gram-Charlier's series of type A and type C, are reviewed with numerical examples. On the basis of these examples, it may be concluded that all the methods, obviously except for the asymptotic expansion, produce desirable result in the central portion of the distribution and that the simultaneous use of the Gram-Charlier series of type A and the asymptotic expansion will be successful in many cases, although not always, to cover the entire domain of the variable.

AD-613 373 Div. 15
CFSTI Prices: HC$1.00 MF$0.50

Mathematics Research Center, Univ. of Wisconsin, Madison.
ON THE SIZE OF THE RIEMANN ZETA-FUNCTION AT PLACES SYMMETRIC WITH RESPECT TO THE POINT 1/2,
by R. D. Dixon and Lowell Schoenfeld. Nov 64, 6p
Technical summary rept. no. MRC-TSR-532
Contract DA11 022ORD2059

Unclassified report

Descriptors: (*Special functions (Mathematical), Number theory), (*Number theory, Special functions (Mathematical)), Series, Inequalities.

Improvement is made on and a simpler proof provided of a result of R. Spira which is to appear in the Duke Mathematical Journal. This result is that if s = sigma + it and zeta is the Riemann zeta-function, then absolute value (zeta (1 - s))> absolute value (zeta (s)) for all s other than zeros of zeta provided t > or = 6.8 and sigma > 1/2. The proof uses Stirling's formula, as did Spira's.

AD-613 390 Div. 15

Brown Univ., Providence, R. I.
ZERO CROSSING PROBABILITIES FOR GAUSSIAN STATIONARY PROCESSES,
by G. F. Newell and M. Rosenblatt. 5 Feb 62, 9p
Grant NSF G19046

Unclassified report

Pub. in Annals of Mathematical Statistics (U. S.) v33 n4 p1306-13 Dec 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Statistical processes, Probability), (*Probability, Statistical processes), Matrix algebra, Analysis of variance, Time, Series.

AD-613 391 Div. 15

Courant Inst. of Mathematical Sciences, New York Univ., N.Y.
ESTIMATES NEAR THE BOUNDARY FOR SOLUTIONS OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS SATISFYING GENERAL BOUNDARY CONDITIONS II,
by S. Agmon, A. Douglis and L. Nirenberg.
May 63, 59p
Contract Nonr28546; Grant DA ARO D31 124G156

Unclassified report

Pub. in Communications on Pure and Applied Mathematics (U. S.) v17 n1 p35-92 Feb 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Partial differential equations, Boundary value problems), (*Boundary value problems, Partial differential equations), Numerical analysis, Integrals.

AD-613 394 Div. 15, 26

New York Univ., N. Y.
STATISTICAL MODELS IN MECHANICAL

RELIABILITY,
by John H. K. Kao. Jan 65, 10p
Contract Nonr28562, Proj. NR042 218
Unclassified report

Pub. in mono. National Symposium on Reliability and Quality Control (no. 11) Miami Beach, Fla., Jan 65. Proceedings, p240-7 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Reliability, Mathematical models), (*Mechanical engineering, Reliability), (*Statistical distributions, Mathematical models), Probability, Failure (Mechanics).

This paper explores and studies statistical models suitable for characterizing the life patterns of mechanical components and systems. Among the models studied are exponential, Weibull (including Rayleigh), extreme-value (Gumbel), gamma (including chi-squared), normal and lognormal. The relationships among and characteristics of these models are explored and summarized. 'Lack of fit' in probability plot of a carefully chosen model signals for 'Action' in much the same manner as 'out-of-control' in a control chart. (Author)

AD-613 396 Div. 15

Michigan State Univ., East Lansing.
NORMAL APPROXIMATION TO THE DISTRIBUTION OF TWO INDEPENDENT BINOMIALS, CONDITIONAL ON FIXED SUM,
by J. Hannan and W. Harkness. 9 May 63, 4p
Contract Nonr241000; Grant NSF G5011
Unclassified report

Pub. in Annals of Mathematical Statistics (U. S.) v34 n4 p1593-5 Dec 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Binomials, Distribution theory), (*Distribution theory, Binomials), Probability, Mathematical logic, Statistical distributions.

AD-613 415 Div. 15

Duke Univ., Durham, N. C.
ON THE REPRESENTATIONS OF THE SEMISIMPLE LIE GROUPS. I. THE EXPLICIT CONSTRUCTION OF INVARIANTS FOR THE UNIMODULAR UNITARY GROUP IN N DIMENSIONS,
by L. C. Biedenharn. 7 Aug 62, 10p
Unclassified report

Pub. in Journal of Mathematical Physics (U. S.) v4 n3 p436-45 Mar 1963 (Copies not available to DDC or Clearinghouse customers)
Supported in part by ARO(D) and NSF.

Descriptors: (*Groups (Mathematics), Invariance), (*Invariance, Groups (Mathematics)), Conformal mapping, Matrix algebra.

It is intended in the present series of papers to discuss explicit constructive determinations of the representations of semisimple Lie groups by an extension of the Racah-Wigner techniques developed for the two-dimensional unimodular unitary group. The present paper defines, and explicitly determines, a symmetric vector-coupling coefficient for the Lie group. These coefficients are utilized to construct a series of canonical invariants for the unitary group, of which the first is the familiar Casimir invariant, and it is proved (by construction) that these invariants form a complete system of independent invariants suitable for uniquely labeling the irreducible inequivalent representations of the unitary group.

AD-613 499 Div. 15

Washington Univ., Seattle.
REMARKS ON THE EQUIVALENCE PRINCIPLE IN FLUCTUATION THEORY,
by Charles Hobby and Ronald Pyke. 11 Jul 62, 7p
Unclassified report

Pub. in Mathematica Scandinavica (Denmark) v12 p19-24 1963 (Copies not available to DDC users).
Supported in part by NSF and ONR.

Descriptors: (*Combinatorial analysis, Real numbers), Sequences, Permutations, Mapping (Transformations), Theory.

AD-613 502 Div. 15

Michigan Univ., Ann Arbor. Coll. of Literature, Science and the Arts.
LACONICITY AND REDUNDANCY OF TOEPLITZ MATRICES,
by P. Erdos and G. Piranian. 31 Jan 63, 14p
Contract AF49 638 633; Grant NSF G23830
Unclassified report

Pub. in Mathematische Zeitschrift (Germany) v83 p381-94 1964 (Copies available only to DDC users).

Descriptors: (*Matrix algebra, Theory), Sequences, Complex numbers, Transformations (Mathematics).

The convergence field of a Toeplitz matrix is a monotonic function of the set of rows that compose the matix, in the sense that the deletion of some of the rows of the matrix (followed by appropriate renumbering of the rows that remain) can never decrease the convergence field. In the case of certain matrices, the deletion of infinitely many rows always increases the convergence field; but there exist matrices that do not have this property. This dichotomy was considered with special reference to the space of bounded sequences and certain classical families of matrices.

AD-613 503 Div. 15

Massachusetts Inst. of Tech., Cambridge.
DIRICHLET PROBLEM FOR delta u = f (P,U),
by Norman Levinson. 1962, 10p
Grant NSF G19864
Unclassified report

Pub. in Journal of Mathematics and Mechanics (U. S.) v12 n4 p567-76 Jul 196?(Copies available only to DDC users).

Descriptors: (*Boundary value problems, Potential theory), (*Partial differential equations, Boundary value problems), Theorems, Sequences, Functions.

AD-613 542 Div. 15
CFSTI Prices: HC$2.00 MF$0.50

Minnesota Univ., Minneapolis.
A CONVERGENCE EQUIVALENCE RELATED TO POLYNOMIALS ORTHOGONAL ON THE UNIT CIRCLE,
by Glen Baxter. 15 Jan 61, 29p
Technical scientific note no. TSN-2
Grant AF AFOSR-61-4
AFOSR 231
Unclassified report

Prepared in cooperation with Aarhus Univ. (Denmark). Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.

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Descriptors: (*Polynomials, Theory), Functional analysis, Determinants, Harmonic analysis, Fourier analysis, Series, Functions.

AD-613 543 Div. 15
CFSTI Prices: HC$3.00 MF$0.75

American Mathematical Society, Providence, R. I.
LECTURE NOTES PREPARED IN CONNECTION WITH THE SEMINARS HELD AT THE SUMMER INSTITUTE ON ALGEBRAIC GEOMETRY, WHITNEY ESTATE, WOODS HOLE, MASSACHUSETTS, JULY 6 - JULY 31, 1964.
1964, 60p
Grant AF AFOSR578 64

Unclassified report

Descriptors: (*Algebraic geometry, Symposia), (*Algebraic topology, Algebraic geometry), Number theory, Groups (Mathematics), Algebra, Complex variables, Topology, Transformations (Mathematics).

Contents:
Seminar on Singularities
Moduli Questions
Seminar on Etale Cohomology of Number Fields
Elliptic Curves and Formal Groups
Families of Abelian Varieties and Number Theory (Seminar on Hyperbolic Varieties and Informal Groups)
Seminar on Commutative Algebra
Etale Cohomology
Fixed Point Theorem Seminar (The Woods Hole Duality Theorem).

AD-613 547 Div. 15, 25
CFSTI Prices: HC$3.00 MF$0.75

Douglas Aircraft Co., Inc., Santa Monica, Calif.
A UNIFIED APPROACH TO THE SYNTHESIS OF ORTHONORMAL EXPONENTIAL FUNCTIONS,
by J. M. Mendel. Jun 64, 58p Rept. no. SM-47667

Unclassified report

Descriptors: (*Special functions (Mathematical), Fourier analysis), (*Fourier analysis, Special functions (Mathematical)), Spectrum analyzers, Functions, Series, Complex variables.

A unified approach is presented for the construction of sets of orthonormal exponential functions, whose elements have the properties, that: (1) they are orthonormal with respect to the weighting function exp(-2bt), b > or = o; (2) their asymptotic order may be chosen arbitrarily, and; (3) their poles may be real, complex, or some may be real and others may be complex. The main results are summarized as theorems and propositions in which the sets of exponentials are derived as transfer functions in the s domain. These theorems and propositions, in effect, supplement the more conventional Gram-Schmidt Procedure which is useful for the orthonormalization of functions in the time domain. Examples are given which illustrate applications of the main results. In addition, a generalized spectrum analyzer, which can be synthesized on an analog computer, is developed for use in the automatic evaluation of Fourier coefficients. (Author)

AD-613 588 Div. 15
CFSTI Prices: HC$1.00 MF$0.50

Boeing Scientific Research Labs., Seattle, Wash.
ON STEEPEST DESCENT,
by A. A. Goldstein. Feb 65, 10p
Mathematical note no. MN-394, D1-82-0413

Unclassified report

Also available from the author.
See also PB-166 962.

Descriptors: (*Integrals, Theory), (*Integration, Functions), (*Numerical methods and procedures, Functional analysis), Iterative methods, Inequalities, Integral equations.

This paper continues studies concerning iterative methods of driving the gradient to zero (A. A. Goldstein, Minimizing functionals on Hilbert space. Computer methods in optimization problems. New York, Academic Press, 1964, p. 159-165). Those studies were concerned with functions which were twice differentiable; in this paper only first derivatives will be assumed. Other results included are a fixed point theorem for 'gradient' operators and a simple proof of the classical method of steepest descent. (Author)

AD-613 609 Div. 15
CFSTI Prices: HC$2.00 MF$0.50

California Univ., Davis.
FINITE MODELS OF IDENTITIES,
by Sherman K. Stein. 1960, 34p
Grant AF AFOSR60 16
AFOSR 1044

Unclassified report

Descriptors: (*Identities, Mathematical models), (*Functional analysis, Identities), (*Groups (Mathematics), Functional analysis), Algebras, Decision theory, Topology, Mapping (Transformations), Set theory, Algebraic topology.

The question is considered: if every solution of a finite set to a certain functional equation satisfies another given functional equation then does every solution. Attention is restricted to algebras with one binary operation (groupoids). The formal aspects of the manipulation of functional identities are studied along with the models satisfying these identities.

AD-613 618 Div. 15
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
USE OF THE 'EXPECTED VALUE SOLUTION' IN LINEAR PROGRAMMING UNDER UNCERTAINTY,
by Albert Madansky. 11 Mar 60, 16p
Rept. no. P-1939

Unclassified report

Descriptors: (*Linear programming, Game theory), Stochastic processes, Probability, Decision theory, Theorems, Costs.

The use of two methods in the one-stage stochastic linear program is discussed: (1) replacing the random elements by their expected values (the 'expected-value solution'); and (2) replacing the random elements by pessimistic estimates of their values (the 'fat' technique). The one-stage problem and the two-stage problem are described, and the relation between the 'fat' techniques used in the one-stage problem and the so-called 'slack' techniques useful in the two-stage problem is demonstrated.

AD-613 627 Div. 15
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.

OPTIMIZING THE EIGHT QUEENS OVERLAY PROBLEM,
by F. J. Gruenberger. Apr 65, 11p
Rept. no. P-3102
Unclassified report

Descriptors: (*Game theory, Permutations), (*Permutations, Game theory), Optimization, Recreation, Mathematical logic.

Twelve basic solutions are presented for the problem of how to place eight queens on a chess board so that no queen attacks any of the others.

AD-613 670 Div. 15, 32
CFSTI Prices: HC$5.00 MF$1.00

California Univ., Los Angeles.
A PARAMETRIC PROGRAMMING SOLUTION TO THE VECTOR MAXIMUM PROBLEM, WITH APPLICATIONS TO DECISIONS UNDER UNCERTAINTY,
by Arthur M. Geoffrion. Feb 65, 152p
Working paper no. WP-68
Contract Nonr23375; Grant NSF GS552, Proj. NR047 041
Unclassified report

Supported in part by Western Management Science Inst. under a grant from the Ford Foundation. See also PB-166 136.

Descriptors: (*Vector analysis, Mathematical programming), (*Decision making, Vector analysis), (*Linear programming, Decision making), (*Decision theory, Economics), Statistical distribution, Mathematical models, Convex sets, Probability, Bargaining.

Some relationships between decision criteria for decision-making under uncertainty and risk are demonstrated. It is suggested that several criteria should be considered simultaneously so as to yield a vector maximum problem to be solved. It is shown that under certain conditions such a vector maximum problem can be reformulated as an equivalent parametric concave programming problem of the form: Maximize ab (x) + (1-a) c (x) subject to d (x) > or = 0 (i=1,...,m) for each fixed value of a in the unit interval, where fb and c are strictly concave functions of the decision vector x, the constraint functions are concave, and certain additonal regularity conditions are satisfied. A class of computational algorithms, based on maintaining a solution to the relevant Kuhn-Tucker conditions as a varies, is given for solving such programs. It is to be noted that the present algorithms also provide a deformation method for (nonparametric) concave programming. Illustrative examples are presented.

AD-613 681 Div. 15
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
SOME ASPECTS OF QUASILINEARIZATION,
by Robert Kalaba. Dec 61, 26p
Rept. no. RM-2924-PR
Contract AF49 638 700
Unclassified report

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Prepared for publication in the Proceedings of the International Symposium on Nonlinear Equations and Nonlinear Mechanics, held Jul 31-Aug 4, 1961 at the Air Force Academy, Colorado Springs, Colorado.
See also AD-605 553.

Descriptors: (*Nonlinear differential equations, Dynamic programming), (*Dynamic programming, Nonlinear differential equations), Operators (Mathematics), Sequences, Boundary value problems, Partial differential equations, Calculus of variations, Statistical mechanics, Neutron transport theory.

Many of the fundamental nonlinear differential equations of mathematical physics and engineering can be written in the form L(u) = max (M(u,x,q) + a(x,q)), where L and M are linear differential operators on u, a scalar function of the vector x, and q is a decision variable. Among these equations are the Riccati equation, which plays a role in studies of wave propagation, neutron transport, and filter theory; the Emden-Fowler equation, of importance in astrophysical and nuclear studies; the Hamilton-Jacobi equation of mechanics; the eikonal equation of optics; and others. In addition, it is a basic equation of dynamic programming. In this paper a formula giving a representation for the solution of the above type of equation is presented. It involves use of 'max' operators applied to solutions of associated linear equations. In turn, this representation formula leads to the construction of quadratically convergent and monotonic sequences of functions which are of utility in the computational solution of nonlinear boundary value problems. Results of some numerical experiments involving both ordinary and partial differential equations are presented. (Author)

AD-613 686 Div. 15, 26
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
THE BOTTLENECK ASSIGNMENT PROBLEM,
by O. Gross. 6 Mar 59, 11p Rept. no. P-1630
Unclassified report

Descriptors: (*Production control, Numerical methods and procedures), Manpower studies, Machines, Labor, Optimization, Permutations.

A simple algorithm for solving either of two different bottleneck assignment problems is described in this paper. The one problem requires finding an assignment of men to machines in a serial production line to maximize the rate of flow through the line; the other requires finding an assignment for parallel production lines (one man per line) so as to minimize the time to do a given job. The two problems are essentially identical. (Author)

AD-613 719 Div. 15, 30
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
LINEAR PROGRAMMING IN A MARKOV CHAIN,
by Philip Wolfe and G. B. Dantzig. 23 Nov 59, 20p
Rept. no. P-1842
Unclassified report

Presented at a Meeting of the American Mathematical Society in New York, April 1960, and a Meeting of the Econometric Society in Palo Alto, Calif., Aug, 1960. Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Linear programming, Probability), (*Probability, Linear programming), Set theory, Functions, Iterative methods, Costs, Inventory.

An infinite Markov process with a finite number of states is studied in which the transition probabilities for each state range independently over sets which are

either finite or are convex polyhedra. A finite computational procedure is given for choosing those transition probabilities which minimize appropriate functions of the resulting equilibrium probabilities. (Author)

AD-613 733 Div. 15

California Univ., Berkeley.
LIMITING DISTRIBUTIONS OF RANDOM SUMS OF INDEPENDENT RANDOM VARIABLES,
by Helen Wittenberg. 27 Jun 63, 13p
Grant DA ARO D31 124G83
AROD 362:63

Unclassified report

Pub. in Zeitschrift fur Wahrscheinlichkeitstheorie und Verwandte Gebiete (West Germany) v3 n1 p7-18 1964 (Copies available to DDC users).

Descriptors: (*Statistical distributions, Stochastic processes), (*Stochastic processes, Statistical distributions), (*Distribution theory, Real numbers), Sequences, Series, Statistical functions.

AD-613 734 Div. 15

Chicago Univ., Ill.
LOCAL PROPERTIES OF SOLUTIONS OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS,
by A. P. Calderon and A. Zygmund. 10 Jan 60, 55p
Contract AF49 638 451; Grant NSF G8205
AFOSR 3329

Unclassified report

Pub. in Studia Mathematica (Poland) n20 p171-225 1961 (Copies available only to DDC users).

Descriptors: (*Partial differential equations, Theory), Functional analysis, Taylor's series, Inequalities, Integral transforms, Integration.

The purpose of the paper is to establish pointwise estimates for solutions of elliptic partial differential equations and systems. The results presented differ from the familiar ones in that they give information about the behavior of solutions at individual points.

AD-613 765 Div. 15

Institute for Advanced Study, Princeton, N. J.
PROPERTIES OF CERTAIN TYPES OF WILD SURFACES IN E(3),
Revised ed.,
by C. E. Burgess. 27 Nov 63, 18p
Grant NSF GP107

Unclassified report

Pub. in American Journal of Mathematics (U. S.) v86 n2 p325-38 Apr 1964. Revision of manuscript submitted 22 Jul 63.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Topology, Spheres), (*Spheres, Topology), Set theory, Differential geometry, Algebraic topology.

AD-613 767 Div. 15

Air Force Cambridge Research Labs., Bedford, Mass.
ON WITT'S THEOREM FOR NONALTERNATING SYMMETRIC BILINEAR FORMS OVER A FIELD OF CHARACTERISTICS 2,
by Vera Pless. 10 Jul 63, 13p AFCRL 65-76, PMSRP-78 Proj. 5632

Unclassified report

Pub. in American Mathematical Society. Proceedings (U.S.). v15 n6 p979-83 Dec 1964.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Algebras, Theorems), Transformations (Mathematics), Invariance, Groups (Mathematics), Vector analysis.

The purpose of this note is to show that an analogue to Witt's theorem holds for a nondegenerate, nonalternating, symmetric bilinear form f over a field K of characteristic 2 where f(x,x) takes its values in a subfield K(*) such that K contains the square root of any element in K(*). As is known Witt's theorem does not hold in general for a field of characteristic 2. However, it is shown that an isometry of a subspace can be extended if it leaves a certain unique vector invariant. The invariants of a subspace of V with respect to the orthogonal group are determined. (Author)

AD-613 777 Div. 15

California Univ., Berkeley.
TOROIDAL ALGEBRAIC GROUPS,
by Maxwell Rosenlicht. 1 Dec 60, 7p
Contract AF49 638 603
AFOSR 3338

Unclassified report

Pub. in American Mathematical Society. Proceedings (U. S.) v12 n6 p984-8 Dec 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Groups (Mathematics), Algebra), Mapping (Transformations), Theorems.

AD-613 787 Div. 15

Chicago Univ., Ill.
A NOTE ON LOCAL PROPERTIES OF SOLUTIONS OF ELLIPTIC DIFFERENTIAL EQUATIONS,
by A. P. Calderon and A. Zygmund. 23 Aug 60, 5p
Contract AF49 638 451
AFOSR 3330

Unclassified report

Pub. in National Academy of Sciences. Proceedings (U. S.) v46 n10 p1385-9 Oct 1960 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Partial differential equations, Inequalities), Operators (Mathematics), Integrals, Integral transforms.

Pointwise estimates are formulated for solutions of elliptic partial differential equations and systems. The results obtained differ from the familar ones in that they give information about the behavior of solutions at individual points. Inequalities are established for solutions and their derivatives at isolated individual points. Results of the 'almost everywhere' type are obtained.

AD-613 791 Div. 15

Syracuse Univ., N. Y.
APPROXIMATION OF SMOOTH FUNCTIONS,
by G. G. Lorentz. 13 Jan 60, 2p
Contract AF49 638 619
AFOSR 3602

Unclassified report

Pub. in American Mathematical Society. Bulletin (U. S.) v66 n2 p124-5 Mar 1960 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Functional analysis, Theorems), Functions, Numerical analysis, Trigonometry.

AD-613 858 Div. 15

Rand Corp., Santa Monica, Calif.
METHODS OF SOLUTION OF LINEAR PROGRAMS UNDER UNCERTAINTY,
by A. Madansky. Apr 61, 10p

Unclassified report

Pub. in Operations Research (U. S.) v10 n4 p463-71 Jul/Aug 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Linear programming, Probability), (*Probability, Linear programming), Stochastic processes.

The three most usual methods of reducing the effects of uncertainty in the technology matrix, requirement vector, or cost vector of a linear programming problem are the expected-value solution, the 'fat' solution, and the 'slack' solution. These methods are explained in some detail, and the relation between these various methods is pointed out. (Author)

AD-613 870 Div. 15

Rensselaer Polytechnic Inst., Troy, N. Y.
EQUILIBRIUM POINTS OF BIMATRIX GAMES.
Revised ed.,
by C. E. Lemke and J. T. Howson, Jr. 13 Nov 63, 12p
Grant AF AFOSR339 63
AFOSR [illegible]

Unclassified report

Pub. in Society for Industrial and Applied Mathematics. Journal (U. S.) v12 no2 p413-23, Jun 64. Revision of manuscript submitted 3 Jul 63. (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Game theory, Matrix algebra), (*Matrix algebra, Game theory), Linear programming, Convex sets, Perturbation theory.

An algebraic proof is given of the existence of equilibrium points for bimatrix (or two-person, non-zero-sum) games. The proof is constructive, leading to an efficient scheme for computing an equilibrium point. In a non-degenerate case, the number of equilibrium points is finite and odd. The proof is valid for any ordered field. (Author)

AD-613 884 Div. 15, 6, 12

Lincoln Lab., Mass. Inst. of Tech., Lexington.
MULTIDIMENSIONAL PARAMETER ESTIMATION BY THE SUMMED WEIGHTED LEAST SQUARES MINIMIZATION OF REMAINDERS,
by Harold Schneider. 31 Mar 64, 18p Rept. no. JA-2338
Contract AD19 628 500

Unclassified report

Pub. in Journal of the Astronautical Sciences (U. S.) v11 n3 p61-76 1964, also includes addendum pub. in Journal of the Astronautical Sciences (U. S.) v11 n3 p77-8 1964.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Least squares method, Atmosphere entry), (*Reentry vehicles, Radar tracking), (*Iterative methods, Nonlinear differential equations), Rocket trajectories, Programming (Computers), Ballistics, Dynamics.

An iterative procedure for estimating the unknown parameters of a coupled set of nonlinear differential equations, given noisy experimental data for the dependent variables, is presented and discussed. The parameters to be estimated are assumed to consist of the initial conditions and a parameter identified as the ballistic coefficient, which appears explicitly in the differential equation set. The measurement errors are assumed to satisfy a joint independent Gaussian distribution. The iteration method was applied to a computer trajectory determination of the Wallops Island Trailblazer (IIa) re-entry body, using coarse radar data and maximum-likelihood methods. (Author)

AD-613 897 Div. 15, 25

Massachusetts Inst. of Tech., Cambridge.
THE STABILITY OF LINEAR, REAL, PERIODIC SELF-ADJOINT SYSTEMS OF DIFFERENTIAL EQUATIONS,
by Norman Levinson. 1963, 10p
Grant NSF GP149

Unclassified report

Pub. in Journal of Mathematical Analysis and Applications (U. S.) v6 n3 p473-82 Jun 1963. (Copies available only to DDC users).

Descriptors: (*Differential equations, Stability), (*Hamiltonian, Stability), Matrix algebra.

AD-613 898 Div. 15

Massachusetts Inst. of Tech., Cambridge.
POSITIVE EIGENFUNCTIONS FOR DELTA u+ lambda f(u)=0,
by Norman Levinson. 23 Jul 62, 16p
Grant NSF G19864

Unclassified report

Pub. in Archive for Rational Mechanics and Analysis (West Germany) v11 n3 p258-72 1962(Copies available only to DDC users).

Descriptors: (*Functions, Partial differential equations), (*Partial differential equations, Functions), Inequalities, Sequences, Theory.

16. Medical Sciences

AD-613 303 Div. 16
CFSTI Prices: HC$1.00 MF$0.50

Florida State Univ., Tallahassee.
SLEEP.
Final rept. for 1 Jan 61-31 Mar 62,
by Wilse B. Webb. 31 Mar 62, 3p
Grant AF AFOSR62 13
AFOSR 64-0013

Unclassified report

Descriptors: (*Sleep, Medical research), Electroencephalography, Alcohols, Purine alkaloids, Sensory deprivation, Sensory perception, Motor reactions, Controlled atmospheres, Tranquilizers, Monitors, Physiology.

Contents:
(1) Effect of alcohol and caffeine on inferred visual dreaming
(2) Effect of Stage IV deprivation
(3) Effects of rate of response requirements on tendency to go to sleep
(4) Effects of meprobamate on sleep patterns during all-night sleep
(5) Parameters of experimentally uninterrupted all-night sleep.

AD-613 318 Div. 16
CFSTI Prices: HC$2.00 MF$0.50

Baylor Univ., Houston, Tex. Coll. of Medicine.
SOME MEMBRANE PROPERTIES OF THE EFFECTOR ORGAN IN THE GALVANIC SKIN RESPONSE,
by Robert Edelberg, Theodore Greiner, and Neil R. Burch. 1960, 27p
Contract AF18 603 79; Grant PHS M1904
AFOSR TN-59-887

Unclassified report

Pub. in American Journal of Physiology (U. S.)
v15 p691-6 1960
Prepared in cooperation with Houston State Psychiatric Inst., Tex.

Descriptors: (*Galvanic skin response, Electrolytes (Physiology)), Membranes (Biology), Permeability, Ph, Resistance (Electrical), Skin, Polarization, Ions, Cleaning compounds.

Some of the membrane-like properties of the effector of the galvanic skin response (GSR) have been demonstrated in human subjects by changes in the external chemical environment and by changes in both the direction and density of imposed current. Potassium ion usually reduces GSR and basal resistance by 40 per cent; large ions like Ca(++) or SO4(=) increase exosomatic and endosomatic GSR up to several hundred per cent, while at the same time reducing basal resistance. GSR and basal resistance fall off at pH values on either side of the neutral range. Cationic and anionic detergents produce a significant reduction in GSR and basal resistance. There is a relatively small influence of polarity of current flow on basal resistance but a pronounced effect on the amplitude of the GSR in the case of large cations or anions combined with smaller ions of opposite charge. Evidence for an 'injury' effect with currents greater than 11 micro Amps/square cm is shown. Inflections in the curve showing polarization potential and relative GSR amplitude as a function of current density may imply the involvement of two or more distinct membranes in the GSR and basal resistance. The various effects on basal resistance and endosomatic and exosomatic GSR are interpreted in terms of a labile, semipermeable membrane located in the skin. (Author)

AD-613 331 Div. 16
CFSTI Prices: HC$1.00 MF$0.50

Mayo Clinic, Rochester, Minn.
BLOOD OXYGEN CHANGES INDUCED BY FORWARD (+Gx) ACCELERATION.
Final rept. for 1 Apr 62-1 Nov 64,
by Natalio Banchero, Lucille Cronin, A. Clark Nolan, and Earl H. Wood. Dec 64, 25p
Contract AF33 657 8899; Grant NIH H3532,
Proj. 7222
AMRL TR-64-132

Unclassified report

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Prepared in cooperation with Mayo Graduate School of Medicine, Rochester, Minn.

Descriptors: (*Acceleration tolerance, Blood analysis), (*Thorax, Acceleration tolerance), Oxygen consumption, Respiration, Blood volume, Arteries, Veins, Lungs, Gravity, Anesthesia, Dogs.

Six dogs under morphine-pentobarbital anesthesia were exposed to forward accelerations of 2, 4 and 6G for one minute and 6G for three minutes while in the horizontal, 15 degrees head-up and 15 degrees head-down positions breathing room air. Exposures to 6G were repeated breathing 99.6% oxygen. Oxygen saturation and opacity at 800 millimicrons of blood were recorded continuously by cuvette oximeters. Pulmonary arterial-venous shunting was estimated from blood oxygen saturations. No systematic changes in femoral artery oxygen saturation occurred at 2G while a small average decrease was observed at 4G (4%). Decreases occurred at 6G averaging 11 (5-17) per cent at the end of the 60-second exposure. Return to control (1G) values was nearly complete 50 seconds after the exposure. Oxygen inhalation delayed but did not prevent the desaturation. These decreases are believed due to pulmonary arterial-venous shunting. The average increase in pulmonary arterial-venous shunt over 1G values estimated at the end of 60-second exposures to 6G when breathing air, was 17 (11-31) per cent. Values for shunts at 6G, when breathing oxygen, were similar.

AD-613 335 Div. 16
CFSTI Prices: HC$1.00 MF$0.50

Mayo Clinic, Rochester, Minn.
USE OF DICHROMATIC EARPIECE DENSITOMETRY FOR DETERMINATION OF CARDIAC OUTPUT.
Final rept. for 1 Oct 63-1 Nov 64,
by John H. Reed, Jr. and Earl H. Wood. Dec 64, 20p
Contract AF33 657 8899; Grant NASA NsG327,
Proj. 7222
AMRL TR-64-134

Unclassified report

Prepared in cooperation with Mayo Graduate School of Medicine, Rochester, Minn.

Descriptors: (*Blood analysis, Oximeters), (*Oximeters, Ear), Heart, Blood volume, Oxygen consumption, Blood circulation, Acceleration, Medical equipment, Dyes, Chemical indicators.

Dye-dilution curves were recorded simultaneously by a monochromatic earpiece densitometer, a dichromatic earpiece densitometer and a cuvette densitometer through which blood was sampled continuously from a radial artery. Comparison of cardiac output values were made using the direct coupled arterial cuvette as a standard in nine healthy subjects during three periods of rest and during two periods of pedalling a bicycle ergometer at different levels of work output. Data are also included from similar studies carried out in five cardiac patients in whom no great vessel or intracardiac shunts could be demonstrated. The results showed a high degree of variability for the monochromatic earpiece densitometer values (standard deviation of differences: ±31%) because of baseline variations due to changing conditions in the ear. The dichromatic earpiece densitometer which compensates for dynamic changes in the ear showed satisfactory comparison with arterial cuvette densitometer (standard deviation of differences: ±14%). The dichromatic earpiece densitometer showed a linear relationship between its calibration factor for dye (centimeters deflection/milligrams dye/liter of blood) and the relative blood content of the ear. A dichromatic ear densitometer appears feasible for estimating cardiac output where use of more direct methods is precluded. (Author)

AD-613 364 Div. 16, 1
CFSTI Prices: HC$3.00 MF$0.75

Office of Aviation Medicine, Federal Aviation Agency, Washington, D. C.
AVIATION MEDICAL PAPERS AND REPORTS. A BIBLIOGRAPHY,
Oct 64, 93p Rept. no. AM-64-20
Unclassified report

Descriptors: (*Aviation medicine, Bibliographies), Civil aviation, Reports, Subject indexing, Catalogs, Indexes.

The bibliography presents an easily accessible record of work done under CAA, FAA and their forerunners in the field of aviation medicine. The document lists those papers and reports available in the Federal Aviation Agency Headquarters Library.

AD-613 377 Div. 16

Los Angeles State Coll., Calif.
DISC ELECTROPHORESIS ANALYSIS OF SIALIDASE FROM INFLUENZA VIRUS,
by J. T. Seto and Y. Hokama. 1963, 12p
Contract Nonr372300, Proj. NR103 527
Unclassified report

Pub. in New York Academy of Sciences. Annals (U. S.) v121 art2 p640-50 Dec 28 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Influenza virus, Enzymes), (*Enzymes, Influenza virus), Electrophoresis, Virus diseases, Metabolism, Purification, Proteins, Antigens and Antibodies, Embryonated egg technique.

Disc electrophoresis per se and in combination with immunodiffusion procedures facilitated the characterization of sialidase. Irrespective of the isolation procedures, sialidase of influenza virus (A2 Japan 305/57) appeared to be electrophoretically heterogeneous. This was indicated by disc electrophoresis and analysis of eluates in the 'segmentation experiments' and by the 'disc immunodiffusion' techniques. It was further noted that 'purified' sialidase in phosphate buffer stored at 0 to 5C. dissocated and simultaneously lost 90 per cent of its enzyme activity. The procedures described above proved valuable, particularly when analyzing limited quantities of material. (Author)

AD-613 378 Div. 16

California Univ., Los Angeles, School of Medicine.
FURTHER OBSERVATIONS BEARING ON THE BONE-BODY FLUID CONTINUUM: COMPOSITION OF THE SKELETON AND SERUMS OF CYCLOSTOMES, ELASMOBRANCHS, AND BONY VERTEBRATES,
by Marchall R. Urist. 1964, 29p
Contract Nonr23374, Proj. NR104 575
Unclassified report

Pub. in Mono. Bone Biodynamics, p151-79 1964. (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Body fluids, Fishes), (*Skeleton, Fishes), Bone, Vertebrates, Minerals, Calcium, Phosphorus, Calcification, Vitamin D, Parathyroid hormones, Estrogens, Metabolism, Paleontology, Desoxyribonucleic acids, Physiology.

Summary: The serum of the lamprey P. marinus possesses low serum total ions and protein concentrations during the larval stage of the life cycle. After metamorphosis, the ion concentration of the serum rises 20 per cent until it is approximately the same as that in teleost fishes. It is postulated that the larval lamprey must develop the mechanism that maintains the ionic concentration of body fluids by circulating enormous volumes of water through the gill chamber to 'pump' and concentrate essential elements from the markedly hypotonic environment. The elasmobranchs store apatite in calcified cartilage, but the mechanism consists of a one-way process of deposition and does not include resorption for metabolic recycling of essential ions. The cartilage retained in the vertebral bodies in the skeletal disorder known as osteopetrosis in human beings, has the same pattern as the calcified cartilage in the spinal column of Elasmobranchii. The parathyroid hormone-vitamin D complex for regulation of calcium ion concentration and calcium balance, and estrogen for control of synthesis of calcium-yolk-protein complexes, appears only in vertebrates having bone tissue in the skeleton. At least sixty factors, and an inconceivable number of combinations of these factors, are involved in the homeostasis of calcium in lower and higher vertebrates.

AD-613 392 Div. 16

University of Southern California, Los Angeles.
CALCULATION OF CHAINLENGTH DISTRIBUTION BETWEEN 'MARKERS' IN MIXED POLYNUCLEOTIDES,
by R. Simha and J. M. Zimmerman. 7 May 64, 6p
Contract Nonr22821
Unclassified report

Pub. in Journal of Theoretical Biology (U. S.) v8 p81-6 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Nucleotides, Molecular structure), (*Molecular structure, Nucleotides), (*Desoxyribonucleic acids, Molecular structure), Degradation, Polymers, Genetics, Matrix algebra.

Based on earlier results and assuming the absence of higher than nearest neighbor effects, expressions are given for the distribution of chainlengths n in a four-component copolymer between two units of a given type.

The results are compared with recent measurements in mixed polynucleotides of the lambda and T6-phage DNA type. The agreement is closer than for a random base arrangement. However, for n > 3, the differences between calculations based on nearest neighbor and random assumptions are negligible. Similarly, the corresponding number average distances between two markers under these two alternatives are practically identical. Therefore, measurements of marker distances are not suitable for the discrimination of non-random base arrangements, except for small distances. The implications of such results on coding hypotheses have already been indicated by Berg, Fancher and Chamberlin. Academic ('Informational macromolecules'. New York, Press, 1963, p. 467).

AD-613 460 Div. 16, 29
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
MILITARY HEALTH AFFAIRS, 1937, VOL. 9, NO. 4 (SELECTED ARTICLES),
by A. Apollonov, V. Mirolyubov, and F. Krotkov.
30 Mar 65, 16p FTD-TT-65-257
TT 65-61951

Unclassified report

Unedited rough draft trans. of Voenno-Sanitarnoe Delo (USS) 1937, v. 9, no. 4, p. 8-14.

Descriptors: (*Oxygen consumption, High altitude), (*Pressure suits, Pilots), Metabolism, Oxygen, Carbon dioxide, Respiration, Adaptation (Physiology), Exercise, USSR.

AD-613 507 Div. 16

George Washington Univ., Washington, D. C.
OBSERVATIONS ON THE DRAINAGE ANGLE IN MAN AND RHESUS MONKEY: A CONCEPT OF THE PATHOGENESIS OF CHRONIC SIMPLE GLAUCOMA; A LIGHT AND ELECTRON MICROSCOPIC STUDY,
by Ben S. Fine. 1964, 37p
Contract DA49 193MD2680, Projs. 6X59 01 001, DAMED DH61 51

Unclassified report

Pub. in Investigative Ophthalmology (U.S.) v3 n6 p609-46 Dec 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Eye, Diseases), Histology, Connective tissue, Cells, (Biology), Pathology, Etiology, Monkeys, Humans, Electron microscopy, Microscopy.

The structure of the anterior chamber angle of primate eyes (man and rhesus monkey) was examined by methods of light and electron microscopy. The anatomic observations indicated that the trabecular meshwork could be clearly and simply divided into two parts by an imaginary line drawn from the region of the scleral roll to the end of Descemet's membrane (Schwalbe's line). The outer layers may be termed the corneoscleral; the inner layers, the uveal. The corneoscleral layers are further subdivided into two parts: a small narrow band of tissue lying adjacent to the inner wall of Schlemm's canal, the juxtacanalicular connective tissue, and a much larger portion, the remainder of the corneoscleral meshwork. Physiologic experiments were carried out in young rhesus monkey eyes by using coarse tracers (India ink) for light microscopy and fine tracers (ferritin molecules) for electron microscopy. The ferritin molecules were found to pass through the juxtacanalicular connective tissue layer to reach the endothelial lining of Schlemm's canal. These endothelial cells took up a number of the ferritin molecules, many within small vesicles, and transported them across the cell cytoplasm, discharging the molecules into the lumen of the canal. Ferritin molecules were also observed to pass in similar fashion into the capillaries of the ciliary muscle and iris root. (Author)

AD-613 531 Div. 16
CFSTI Prices: HC$5.00 MF$1.25

Prosthetic and Sensory Aids Service, Veterans Administration, Washington, D. C.
BULLETIN OF PROSTHETICS RESEARCH,
1964, 192p Rept. no. BPR-10-2

Unclassified report

Descriptors: (*Prosthetics, Medical research), Medical equipment, Therapy, Amputees, Amputation stumps, Blood circulation, Arms, Muscles, Adjustment (Psychology), Shoes, Patents, Research program administration, Hospitals.

Contents:
Bioengineering Evaluation and Field Test of the Stand-Alone Therapeutic Aid
Stump Arterial Circulation and Its Relationship to the Prescription of a Prosthesis for the Geriatric Patient
The Shoe in Lower-extremity Orthotics
Prosthetics Committees of the NAS-NRC
Manipulators and Upper-extremity Prosthetics
Semiannual Report of the VAPC
Notes on VA Contractors
Notes and News
Reported Abroad
Recent Patents
Publications of Interest
Calendar of Events.

AD-613 541 Div. 16
CFSTI Prices: HC$2.00 MF$0.50

Mayo Clinic, Rochester, Minn.
END-EXPIRATORY PLEURAL PRESSURES IN DOGS IN SUPINE AND PRONE BODY POSITIONS STUDIED WITHOUT THORACOTOMY.
Final rept. for 15 Jul 63-1 Nov 64,
by Wilhelm J. Rutishauser, Natalio Banchero, Anastasio G. Tsakiris, Ralph E. Sturm, and Earl H. Wood. Dec 64, 31p
Contract AF33 657 8899, Proj. 7222
AMRL TR-64-133

Unclassified report

Descriptors: (*Acceleration tolerance, Thorax), (*Thorax, Acceleration tolerances), Pressure, Posture, Cannulation, Recording systems, Respiration, Heart, Lungs, Weight, Dogs, Measurement.

Intrapleural pressures were measured simultaneously by saline-filled catheters from 2 to 5 different sites in the potential right pleural space of nine anesthetized dogs while the animals were supported in the supine and prone positions by means of molded half-body casts. Intrapleural tips of the catheters were placed at heart level in the cephalad-caudad dimension at ventral (retrosternal) and dorsal (paravertebral) sites in the thorax. The site of each catheter tip was measured from biplane x-rays taken in each position. The average vertical distance between the dorsal and ventral catheter tips was 10.6 (S.E. of Mean = ±0.3) cm. In the supine position, mean end-expiratory pressure at the superior (ventral) catheter tip was -11.9 (±0.7) cm. H2O as compared to -5.0 (±0.5) cm. H2O at the dependent (dorsal) site giving an average

gradient of 0.64 (±0.04)cm. H2O/cm. vertical distance between the two recording sites. The respective values in the prone position were: -9.0 (±0.6) cm. H2O superior (dorsal) site; +0.7 (±0.5) cm. H2O dependent (ventral) site; gradient: 0.91 (±0.05) cm. H2O/cm. vertical distance. The slightly positive value for retrosternal pleural pressure and the greater dorsal-ventral gradient, when in the prone position, may be due to the weight of the heart. During the increase in weight induced by acceleration, these pressures were multiplied roughly in proportion to the G level and the difference in gradient between the two body positions was maintained. (Author)

AD-613 560 Div. 16
CFSTI Prices: HC$1.00 MF$0.50

Geoscience Ltd., La Jolla, Calif.
THERMAL AND ELECTRICAL CONDUCTIVITIES OF BIOLOGICAL FLUIDS AND TISSUES.
Quarterly rept. for 1 Oct-31 Dec 64,
by Heinz F. Poppendiek, Norman D. Greene, Juanita E. Chambers, Leon V. Feigenbutz, and John R. Murphy. 31 Dec 64, 14p Rept. no. GLR-33
Contract Nonr409500
Unclassified report

See also AD-608 768.

Descriptors: (*Blood, Freezing), (*Body fluids, Thermal conductivity), (*Thermal conductivity, Tissues (Biology)), (*Electrical conductance, Body fluids), Erythrocytes, Cryogenics, Storage, Preservation, Hemolysis, Blood plasma, Beef, Brain, Bone marrow, Stress (Physiology).

This report describes Geoscience's research on thermal and electrical conductivities of biological fluids and tissues. Cryogenically frozen and stored samples from the Presbyterian Medical Center in San Francisco were thawed and electrical and thermal conductivity measurements were made and the results analyzed. The thermal conductivities of beef brain and bone marrow were measured. Additional work was conducted on methods of relating the thermal conductivities of biological materials to chemical compositions. (Author)

AD-613 564 Div. 16

Chicago Univ., Ill.
A CAPILLARY TUBE, NILE BLUE METHEMOGLOBIN REDUCTION TEST FOR GLUCOSE-6-PHOSPHATE DEHYDROGENASE DEFICIENCY,
by J. E. Bowman, P. E. Carson, H. Frischer, Miriam Kahn and F. A. Ajmar. 1963, 11p
Contract DA49 007MD968; Grant PHS GM11617 01
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Blood transfusions, Saccharide phosphates), (*Saccharide phosphates, Deficiency diseases), (*Deficiency diseases, Tests), Hemolysis, Erythrocytes, Hemoglobin, Chemical indicators, Dyes, Anticoagulants, Genetics, Blood diseases, Males, Females, Test methods.

A modification of the methemoglobin reduction test for G-6-PD deficiency is introduced which uses smaller amounts of blood in capillary tubes (approximately 0.025 ml), a shorter period of incubation, the substitution of Nile blue for methylene blue, and alteration of the concentrations of sodium nitrite and glucose in order to obtain the desired result. The test is based on the principle that in the presence of Nile blue, methemoglobin reduction is mainly NADP-linked and is thus dependent on G-6-PD activity (BEUTLER and BALUDA). In the presence of Nile blue, erythrocytes from unaffected subjects reduce nitrite-induced methemoglobin to oxyhemoglobin at a faster rate than do G-6-PD deficient erythrocytes.

AD-613 571 Div. 16, 28
CFSTI Prices: HC$1.00 MF$0.50

Yale Univ., New Haven Conn. School of Medicine.
NEUROLOGICAL MECHANISMS IN EPILEPSY AND BEHAVIOR.
Final rept. for 1 Nov 53-31 Oct 63,
by Jose M. R. Delgado. Mar 65, 14p
Contract Nonr60908, Proj. NR101 320
Unclassified report

Descriptors: (*Epilepsy, Neurology), (*Behavior, Neurology), (*Neurology, Medical research), Brain, Electrodes, Diagnosis, Learning, Central nervous system, Stimulation, Physiology, Indexes, Bibliographies.

The report describes the research being conducted on the neurological mechanisms involved in epilepsy and behavior. Clinical applications derived from the studies are discussed, and indexes of technical reports and publications which have been issued as a result of the research are presented.

AD-613 584 Div. 16, 1
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
EFFECT OF ALTITUDE ON THE ORGANISM OF FLIERS IN FLIGHT,
by A. Apollonov and V. Mirolyubov. 7 Apr 65, 19p
FTD-TT-65-259
TT 65-61970
Unclassified report

Unedited rough draft trans. of Voenno Sanitarnoe Delo (USSR) 1938, v. 10, no. 7, p. 16-24.

Descriptors: (*Pilots, Hypoxia), (*Hypoxia, High altitude), (*Aviation medicine, Hypoxia), Flight, Anoxia, Respiration, Blood circulation, Oxygen consumption, Blackout (Physiology), Pain, Perception, USSR.

The physiological effects on pilots during high altitude flight are discussed. The symptoms of high altitude sickness resulting from oxygen deficiency are described.

AD-613 585 Div. 16, 20
CFSTI Prices: HC$8.15 MF$2.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
RADIATION MEDICINE,
by A. I. Burnazyan and A. V. Lebedinskii. 23 Feb 65, 513p FTD-TT-64-1058
TT 65-61971
Unclassified report

Unedited rough draft trans. of mono. Radiatsionnaya Meditsina, Moscow, 1963, 372p.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Radiobiology, Medical research), (*Radiation effects, Pathology), Radiation sickness, Radiation injuries, Radioactivity, Radioactive decay, Cosmic rays,

Dosimeters, Radiological dosage, Dose rate, Nuclear explosions, Nuclear particles, Radioactive fallout, Tissues (Biology), Nervous system, Hemopoietic system, Cardiovascular system, Respiratory system, Gastrointestinal system, Metabolism, Toxicity, Infections, Burns, Radioprotective agents, Diagnosis, Therapy, USSR.

Contents: Physics and dosimetry of ionizing radiation; Pathophysiology of radiation affections; Infection and immunity in irradiated organisms; Toxicology of radioactive substances; Pathologoanatomy of radiation affections; Chemical protection against ionizing radiation; Symptomatology and treatment of radiation sickness; Acute radiation damage to tissue.

AD-613 617 Div. 16, 20
CFSTI Prices: HC$4.00 MF$1.00

Scripps Institution of Oceanography, Univ. of California, La Jolla.
EFFECTS OF NUCLEAR EXPLOSION ON MARINE BIOLOGY,
ed. by M. B. Schaefer. Aug 56, 144p
Proj. 2 5
WT 1013; ITR 1063 superseded
Unclassified report

Rept. on Operation Wigwam.

Descriptors: (*Marine biology, Radiation effects), (*Radiation hazards, Marine biology), Nuclear explosions, Radiological contamination, Fishes, Aquatic animals, Plankton, Sea water, Eggs, Larvae, Fission products, Radioactivity, Gamma rays, Beta decay.

In order to provide biological information for the conducting of this weapon test in such a manner as to eliminate or minimize hazard through contamination of commercial fisheries products, investigations were conducted along three lines: (1) Studies of the distribution of marine organisms in and near the proposed test area to provide information which, together with data from Project 2.8 on currents, would make possible the selection of a test location such that the hazard to the fisheries would be minimal. (2) Laboratory studies on the uptake of fission products by fishes and other marine organisms to provide basic information on the uptake of such products from sea water and their retention and excretion by the organisms. (3) Field studies following the test to investigate the uptake of resulting fission products by marine organisms. On the basis of these studies, together with information from other projects, it was possible to select a test location which resulted in no hazard to commercially important types of fish. However, such events occurring in biologically more productive areas, closer to commercial fishing areas, or in regions where the contaminated water would be carried into commercial fishing areas could result in important hazards. The laboratory and field data reported here should provide some basis of evaluating the hazards involved in the occurrence of such events in other areas. (Author)

AD-613 659 Div. 16, 4
CFSTI Prices: HC$3.00 MF$0.75

Applied Science Labs., Inc., State College, Pa.
ANALYSIS AND PHYSICOCHEMICAL STUDIES OF INTRAVENOUS FAT EMULSIONS AND COMPONENTS.
Rept. for 1 May 64-1 Mar 65,
by Arthur Rose, Nicholas Pelick, John H. Tinker, T. L. Wilson, and Gerald A. Porter. 1 Mar 65, 53p
Contract DA49 I93MD2155
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-425 213.

Descriptors: (*Parenteral infusions, Fats), (*Fats, Colloids), (*Colloids, Fats), Colorimetric analysis, Iron compounds, Thiocyanates, Peroxides, Carbohydrates, Amines, Chromatographic analysis, Lipids, pH, Particle size, Steroids, Fatty acids.

The report gives further data on chemical composition, particle size and pH variation in intravenous fat emulsions in current and recent use. Some retests were made on old emulsions of the previous reports. All of the new emulsions that have been received were tested. New colorimetric procedures with ferrous thiocyanate reagent show the presence of peroxy and hydroperoxy derivatives in varying amounts in most of the emulsions, apparently associated with triglycerides and phospholipids. Other colorimetric tests have been introduced, to detect carbohydrates and amine-type compounds. Improved thin layer chromatography development procedures indicate the presence of bound lipids in the water phase. A two-dimensional TLC technique is illustrated. Practically all emulsions are continuing to show a decrease in pH as time passes. Some of the most recently submitted emulsions are showing a more rapid pH drop than has been previously noted. (Author)

AD-613 668 Div. 16
CFSTI Prices: HC$1.00 MF$0.50

Maryland Univ., College Park.
CURRENT REFERENCES IN MEDICAL ENTOMOLOGY FROM RUSSIAN, CENTRAL AND EASTERN EUROPEAN AND CHINESE LITERATURE, VOLUME IV, NO. 3,
ed. by George Anastos. 1965, 23p
Contract DA49 193MD2238
TT 65-61974
Unclassified report

Descriptors: (*Insects, Bibliographies), (*Bibliographies, Insects), (*Disease vectors, Bibliographies), Ticks, Mites, Diptera, Siphonaptera, Hemiptera, Lice, Bacteria, Spirochaeta, Rickettsia, Parasites, Virus diseases, Pest control, Insecticides, Toxicity, USSR, Eastern Europe, China.

AD-613 680 Div. 16, 28
CFSTI Prices: HC$1.00 MF$0.50

Biotechnology Lab., Univ. of California, Los Angeles.
UPPER EXTREMITY PROSTHETICS RESEARCH, HUMAN TRACKING, SENSORY MOTOR CONTROL, AND MYOELECTRIC CONTROL.
Progress rept.
15 Mar 65, 24p Engineering dept. rept. no. 65-14
Contracts V1005p9779, N123 60530 32857A
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also AD-610 670.

Descriptors: (*Prosthetics, Pneumatic devices), (*Amputees, Therapy), (*Tracking, Performance (Human)), (*Artificial limbs, Electronic equipment), Arms, Hands, Muscles, Motor reactions, Display systems, Target acquisition, Surgery, Design, Fatigue (Physiology), Training, Control.

Contents: I. Upper Extremity Prosthetics Research: Needs analysis for development of externally-powered prostheses design specification; Analysis of existing externally-powered prostheses and development of

advanced design specification; Current status of experimental investigations of the Heidelberg Pneumatic Arm; Current status of experimental investigations of the Northwestern Attitudinally Controlled Elbow; Current status of experimental investigations of the AIPR Pneumatic Arm; Evaluation of the utility of minor surgical alterations for developing body control sites for externally powered prostheses; Exploration of harnessing techniques for control site harnessing. II. Research on Sensory Motor Control: Current status of experimental investigations of functional muscle isolation; Isolation and coordination of new control sites; Two-dimensional pursuit tracking apparatus for two-control sites coordination training; Training for three-control sites coordinated activity; Development of an external logic system; Performance evaluation of the Belgrade (Yugoslavia) Electronic Hand.

AD-613 682 Div. 16

Air Proving Ground Center, Elgin AFB, Fla.
ECOLOGICAL AND EPIDEMIOLOGICAL STUDIES OF MONA ISLAND, PUERTO RICO,
by Merle L. Kuns, Thomas P. Griffin, Theodore Brenner, and Warren E. Pippin. Apr 65, 147p
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Epidemiology, Puerto Rico), (*Ecology, Vertebrates), Population, Food, Disease vectors, Microbiology, Bacteria, Parasitic diseases, Virus diseases, Invertebrates, Antigens and antibodies, Pathology.

Ecological studies reported include seasonal and distributional aspects of vertebrate population dynamics, and vertebrate population levels and feeding habits. Epidemiological studies reported cover bacteriology, pathology, parasitology, and virology, the latter in much detail. Virological investigations of the resident and transient vertebrate population of the island indicated the possible presence of St. Louis encephalitis, Eastern and Western equine encephalitis, Venezuelan equine encephalitis, psittacosis, and encephalomyocarditis. Complement-fixation tests for detection of Q fever and tests for neutralizing antibodies against rabies proved negative. Appendices to the report include annotated lists of vertebrates (104 entries) and invertebrates (672 entries). (Author)

AD-613 705 Div. 16, 31
CFSTI Prices: HC$2.00 MF$0.50

Tidewater (AD31)
THE EVALUATION OF THE DENSPLY CAVITRON ULTRASONIC PROPHYLAXIS UNIT ON A NAVAL VESSEL.
Final rept.,
by S. V. Holroyd. Mar 65, 35p
Unclassified report

Descriptors: (*Dentistry, Naval vessels (Support)), (*Ultrasonic radiation, Dentistry), Teeth, Diseases, Medical equipment, Pathology, Histological techniques, Dental personnel, Naval personnel, Training, Statistical analysis.

The following conclusions were drawn from the study: (1) The Cavitron unit can be easily installed aboard a naval vessel. (2) It does not appear that significant problems exist relative to the function or maintenance of the Cavitron aboard a naval vessel. (3) Dental technicians adapt quickly to Cavitron instrumentation. (4) A statistically significant (P< .001) time saving of 36% may be expected in Cavitron prophylaxes. (5) Cavitron stain removal appears to be satisfactory but inferior to conventional stain removal (P < .001). (6) Cavitron calculus removal appears to be equal to conventional calculus removal in 'light' cases while incorporating the 36% time saving. (7) Cavitron calculus removal appears to be superior to conventional calculus removal in 'moderate-heavy' cases (P < .002) while incorporating the 36% time saving. (8) Soft tissue damage is insignificant by either method but Cavitron instrumentation may provide less damage in 'moderate-heavy' cases (P < .03). (9) A strong patient and operator preference exists for the Cavitron technique. (10) No significant difference exists between the 2 methods relative to 24 hour postoperative tooth sensitivity. (11) Significant, quantitative operator differences exist. (12) In general, it may be stated that the study has found the Cavitron to be a highly useful adjunct to dental treatment aboard a naval vessel. (Author)

AD-613 727 Div. 16

Centre d'Etude de Physiologie Nerveuse et d'Electrophysiologie, Paris (France).
DUAL RESPONSES TO VISUAL STIMULATION IN THE MEDIAN NUCLEUS (Dualite des Reponses du Centre Median a la Stimulation Visuelle),
by Denise Albe-Fessard and Alberto Mallart.
1960, 4p
Contract AF61 052 103
AFOSR TN-60-1384
Unclassified report

Pub. in Academie des Sciences, Paris. Comptes Rendus (France) n251 p1191-3 Sep 12 1960 (pub. by Gauthier-Villars et Cie, Paris) (Copies available only to DDC users).
Text in French.

Descriptors: (*Vision, Stimulation), (*Nerve cells, Vision), Thalamus, Visual perception, Electrodes, Adaptation (Physiology), Cats, France.

AD-613 730 Div. 16

Milan Univ. (Italy).
PHYSIOLOGY. DISTRIBUTION OF THE FREQUENCY OF DISCHARGE OF SINGLE FIBERS OF THE MUSCULAR SYSTEM IN MAN DURING MAXIMUM ISOMETRIC CONTRACTION (Fisiologia. Distribuzione della Frequenza di Scarica della Singola Fibra del Sistema Muscolare dell'uomo Durante Contrazioni Isometriche Massimali),
by Francesco Bracchi, Miryam Cattorini, and Torquato Gualtierotti. 19 Nov 60, 5p
Contract AF61 052 23
AFOSR 1242
Unclassified report

Pub. in Accademia Nazionale dei Lincei. Atti (Italy). v29 (Ser8) n5 Dec 1960.
Copies available only to DDC users.
Text in Italian.

Descriptors: (*Neuromuscular transmission, Contraction), (*Muscles, Contraction), Physiology, Italy.

AD-613 731 Div. 16

Milan Univ. (Italy).
PHYSIOLOGY. LABYRINTHINE LESIONS IN FROGS SUBJECTED TO CENTRIFUGATION (Fisiologia. Le Lesioni del Labirinto nelle Rane Sottoposte a Centrifugazione),

by Claudio Testa and Umberto Bordoni. 19 Nov 60, 4p
Contract AF61 052 23
AFOSR 1243

Unclassified report

Pub. in Accademia Nazionale dei Lincei. Atti (Italy). v29 (Ser8) n6 Dec 1960.
Copies available only to DDC users.
Text in Italian.

Descriptors: (*Amphibians, Acceleration tolerance), (*Acceleration tolerance, Vestibular apparatus), Centrifuges, Gravity (Artificial), Ear, Physiology, Italy.

AD-613 735 Div. 16

Centre d'Etudes de Physiologie Nerveuse et d'Electrophysiologie, Paris (France).
ACTIVATING CORTICO-MESENCEPHALIC PATHWAYS BY SENSORY STIMULATION IN THE CAT (Mise en jeu des Voies Cortico-Mesencephaliques sous l'Effet de Stimulations Sensorielles chez le Chat),
by P. Buser and P. Borenstein. 1960, 1p
Contract AF61 052 103
AFOSR 236

Unclassified report

Pub. in Journal de Physiologie (France) v52 n40 p1 1960 (Copies available only to DDC users).
Text in French.

Descriptors: (*Sensory mechanisms, Stimulation), (*Brain, Stimulation), Neurology, Physiology, Cerebral cortex, Cat, France.

AD-613 736 Div. 16

Centre d'Etudes de Physiologie Nerveuse et d'Electrophysiologie, Paris (France).
OBSERVED RESPONSES IN THE MEDIAN THALAMIC NUCLEUS OF THE AWAKE, UNRESTRAINED CAT WITH IMPLANTED ELECTRODES (Responses Observees dans le Centre Median du Thalamus Chez de Chat Eveille, Libre, Porteur d'Electrodes a Demeure,
by Denise Albe-Fessard, Jean Massion and Michel Meulders. 11 Apr 60, 4p
Contract AF61 052 103
AFOSR TN-60-1363

Unclassified report

Pub. in Academie des Sciences, Paris. Comptes Rendus (France) v250 p2928-30 Apr 25 1960 (pub. by Gauthier-Villars et Cie, Paris.) (Copies available only to DDC users).
Text in French.

Descriptors: (*Thalamus, Stimulation), Nervous system, Physiology, Nerve cells, Anesthetics, Electrodes, Cats, France.

AD-613 751 Div. 16

Argonne Cancer Research Hospital, Chicago, Ill.
PATTERNS OF HEMOLYTIC SUSCEPTIBILITY AND METABOLISM,
by P. E. Carson, G. T. Okita, H. Frischer, J. Hirasa, and W. K. Long. 1963, 11p
Contract DA49 007MD968; Grant PHS GH6078

Unclassified report

Pub. in mono. Congress of the European Society of Haematology (no. 9) Lisbon, 1963. Proceedings, Basel/New York, 1963 p655-65.
Copies available only to DDC users.

Descriptors: (*Saccharide phosphates, Deficiency diseases), (*Blood diseases, Saccharide phosphates), (*Glucose, Metabolism), Genetics, Hemolysis, Erythrocytes, Respiration, Cells (Biology), Anemias, Glutathione, Labeled substances.

The study of G-6-PD deficiency is approached on the whole body, clinical, cellular, and molecular levels. Data are presented in three parts: (1) C(14)02 expiration after injection of C(14) labeled glucose; (2) glutathione reductase activities in hemolysates of G-6-PD and glutathione reductase deficient erythrocytes; and (3) stromal effects on the hemolysate enzymes.

AD-613 759 Div. 16

Naval Medical Research Unit no. 2, Taipei (Taiwan).
THE 1961 CHOLERA EPIDEMIC IN MANILA, REPUBLIC OF THE PHILIPPINES,
by Craig K. Wallace, Anastacia E. Fabie, Ophelia Mangubat, Emma Velasco, and Corazon Juinio. 1964, 17p Research rept. MR-005.09-1040.1.10

Unclassified report

Pub. in World Health Organization. Bulletin (Switzerland) v30 p795-810 1964 (Copies available only to DDC users).

Descriptors: (*Cholera, Philippines), (*Epidemiology, Cholera), Diseases, Diagnosis, Bacteria, Immunity, Diarrhea, Emesis, Etiology, Diet, Hospitals, Medical examination, Therapy, Graphics.

A pandemic of El-Tor-type cholera began in southeast Asia during 1961. Many members of the medical profession, as well as government officials and the public, were confused by the relationship between the disease caused by the El Tor organism and classic Asiatic cholera. The authors observed large numbers of cholera patients admitted to San Lazaro Hospital, Manila, early in the Philippine epidemic, and in the present communication they draw attention to certain clinical and epidemiological features of so-called El Tor cholera. The paper not only describes the patients and the epidemic, but also suggests some of the treatment needs during such an epidemic. No indication was found that the disease caused by the classic cholera vibrio is different from that which is designated the El Tor variant. (Author)

AD-613 760 Div. 16

Naval Medical Research Unit no. 2, Taipei (Taiwan).
STUDIES OF PYRIDOXAL-PENICILLAMINE ANTAGONISM IN THE HUMAN,
by Jun-Bi Tu, R. Quentin Blackwell, William C. Cooper and Yu-Hwa Chen. 28 May 64, 11p, Research rept. MR-005.09-1901.2.6

Unclassified report

Pub. in Biochemical Pharmacology (Gt. Brit.) v13 p1527-35 1964 (Copies available only to DDC users).

Descriptors: (*Aldehydes, Pharmacology), (*Penicillins, Pharmacology), (*Vitamin B complex, Pharmacology), (*Eye, Diseases), Amines, Antimetabolites, Tryptophan, Quinolines, Excretion, Urine, Amino acids, Thiols, Humans, Taiwan.

The pyridoxal-L-penicillamine antagonism previously studied by others in lower animals has now been studied in man by means of urinary xanthurenic acid (XA) excretion levels. Subjects of the present study, all Chinese,

included 21 normal individuals and 2 patients with Wilson's disease. The studies involved urinary XA determinations, with and without tryptophan-loading tests, and with varying dosage combinations of penicillamines and pyridoxine hydrochloride. It was found that urinary XA excretions remained normal after DL-penicillamine or DL-tryptophan alone but increased when the two were taken together; pyridoxine hydrochloride prevented the increase. No increases in urinary XA excretion occurred when D-penicillamine or N-acetyl-DL-penicillamine were used in place of the DL-penicillamine during tryptophan loading. These results support the thesis that a pyridoxal-L-penicillamine antagonism can operate in the human, both in normal individuals and in those with Wilson's disease.(Author)

AD-613 761 Div. 16

Centre d'Etude de Physiologie Nerveuse et d'Electro-physiologie, Paris (France).
SOMESTHETIC PROJECTIONS TO THE ANTERIOR MEDIAN SURFACE OF THE CORTEX IN THE CAT ANESTHETIZED WITH CHLORALOSE (Projections Somesthesiques sur la Face Mediane Anterieure du Cortex chez le Chat, Anesthesie au Chloralose),
by J. Bruner and P. Buser. 1960, 4p
Contract AF61 052 103
AFOSR 237

Unclassified report

Pub. in Societe de Biologie et de ses Filiales. Comptes Rendus des Seances (France) v154 n3 p530-3 Mar 26, 1960.
Copies available only to DDC users.
Text in French.

Descriptors: (*Brain, Stimulation), Cerebral cortex, Electroencephalography, Anesthetics, Cats, France.

AD-613 762 Div. 16

Oxford Univ. (England).
ENZYMIC OXIDATION OF 5-HYDROXYTRYPTAMINE BY PIG SERUM,
by H. Blaschdo and W. G. Levine. 5 Sep 60, 3p
AFOSR 736

Unclassified report

Pub. in Journal of Physiology (Gt. Brit.) v154 p599-601 1960 (Copies available only to DDC users).

Descriptors: (*Amines, Oxidation), (*Oxidoreductases, Blood plasma), Enzymes, Proteins (Conjugated), Purification, Indoles, Copper, Swine, Great Britain.

The oxidation of 5-hydroxytryptamine (5-HT) by pig serum was studied. Fractionation of the serum proteins showed that 5-HT is not a substrate of the amine oxidase present in the serum; its oxidation is catalysed by caeruloplasmin, the copper-containing protein of plasma. (Author)

AD-613 763 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
AGGLUTINATING, LETHAL TOXIN AND EL TOR HAEMOLYSIN NEUTRALIZING POTENCY OF SERA IN CHOLERA,
by Oscar Felsenfeld, Napha Nasuniya, Yoshikazu Watanabe, Anita Pena, and Ben N. Dale. 1964, 12p

Unclassified report

Pub. in World Health Organization. Bulletin (Switzerland) v30 p833-44 1964 (Copies available only to DDC users).

Descriptors: (*Cholera, Toxins and antitoxins), (*Epidemiology, Cholera), Immunity, Antigens and antibodies, Vaccines, Infections, Diseases, Disease vectors, Tests, Thailand, Japan.

Recent epidemics of 'classic' Vibrio comma and El Tor infections have provided an opportunity to compare the agglutination test with two other serological procedures recently introduced in cholera work. These are determination of the circulating antitoxin expressed as the lethal toxin neutralizing power of a serum, and determination of the haemolysin neutralizing power through serial test-tube dilutions. Applying these tests to sera from cholera patients, convalescents, carriers and contacts and from immunized persons either exposed or not exposed to cholera, the authors found the agglutination test to be a less sensitive indicator of the immunological status than the other two procedures. They therefore recommend antitoxin and antihaemolysin titration for the study of cholera patients, convalescents and carriers. In the conditions of the experiments described, the results with exposed and non-exposed vaccinated individuals were less conclusive, but nevertheless suggest that antitoxin and antihaemolysin tests may be helpful in the follow-up of vaccination experiments. (Author)

AD-613 764 Div. 16, 28

Walter Reed Army Inst. of Research, Washington, D. C.
DIFFERENTIAL EFFECT OF LSD UPON HABITUATING AND EXTINGUISHING EVOKED RESPONSES,
by Guy C. Sheatz and Donald F. Bogdanski.
27 Apr 64, 8p

Unclassified report

Pub. in Journal of Neuropsychiatry (U. S.) v5 n8 p585-92 Nov-Dec 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Lysergic acids, Conditioned reflex), (*Conditioned reflex, Lysergic acids), Behavior, Electroencephalography, Auditory perception, Oscillation, Barbiturates, Central nervous system, Drugs, Dosage, Nervous system, Physiology.

LSD, in small doses (10 micrograms/kg) which affect behavior only in the absence of an active environment and which only minimally alter the spontaneous EEG, draws a clear distinction between habituating and extinguishing evoked auditory responses by preferentially facilitating the latter. It also establishes a condition favorable to prolongation or oscillation of the response. Response components may be visible as long as 5 sec. following the click. LSD potentiated responses do not follow the usual fast extinction curve, but they are easily reduced by distraction and by small doses of nembutal. (Author)

AD-613 773 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
MODE OF ACTION OF CHLORAMPHENICOL. IX. EFFECTS OF CHLORAMPHENICOL UPON A RIBOSOMAL AMINO ACID POLYMERIZATION SYSTEM AND ITS BINDING TO BACTERIAL RIBOSOME,
by Alan David Wolfe and Fred E. Hahn.
22 Jul 64, 11p

Unclassified report

Pub. in Biochimica et Biophysica Acta (Netherlands) v95 p146-55 (Copies available only to DDC users).

Descriptors: (*Chloramphenicol, Ribosomes), (*Amino acids, Polymerization), (*Ribosomes, Chloramphenicol), (*Antibiotics, Ribosomes), Bacteria, Metabolism, Phenylalanine, Peptides, Ribonucleic acids, Proteins, Biosynthesis, Inhibition, Stereochemistry.

Chloramphenicol at a constant concentration inhibited the polymerization of phenylalanine in a bacterial ribosome-polyuridylic acid system by a constant percentage when graded concentrations of ribosomes, polyuridylic acid, or transfer ribonucleic acid limited the activity of the system. Chloramphenicol combined weakly but stereospecifically with 70-S ribosomes; the average number of chloramphenicol molecules binding to a ribosome was of the order of 1. The hypothesis is proposed that ribosome-bound chloramphenicol interferes with a function of messenger ribonucleic acid. (Author)

AD-613 793 Div. 16

Pennsylvania Univ., Philadelphia. School of Medicine.
PRODUCTION OF DIABETES INSIPIDUS IN HYPOPHYSECTOMIZED RATS BY HYPOTHALAMIC LESIONS,
by C. C. Gale, S. Taleisnik, and S. M. McCann.
17 May 61, 4p
Contract AF49 638 685; Grant NIH A1236C4
AFOSR 844

Unclassified report

Pub. in American Journal of Physiology (U. S.) v201 n5 p811-4 Nov 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Diabetes, Etiology), (*Pituitary gland, Diabetes), Excision, Water, Adrenocorticotropic hormone, Urine, Hormones, Rats.

Lesions in the median eminence produced permanent diabetes insipidus (DI) in chronically hypophysectomized rats. Water turnover in these animals, however, was only about half of that observed when lesions were made in rats with intact pituitaries and was further characterized by absence of the normal interphase. Conversely, when hypophysectomy was performed in rats with DI, an immediate and sustained 50% reduction in water intake occurred. Administration of adrenocorticotropin to hypophysectomized rats with lesions caused significant augmentation of DI, but not to levels found in rats with DI and intact pituitaries. Neither somatotrophic hormone (STH) nor triiodothyronine increased water turnover when given to hypophysectomized animals with DI. Lesions in the median eminence of hypophysectomized rats induced an immediate increase in urine volume in the absence of water intake, which indicates that primary polyuria was responsible at least in part for the development of DI in hypophysectomized rats with lesions. (Author)

AD-613 803 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
ACUTE RADIATION NEPHRITIS,
by F. K. Mostofi. 1964, 5p

Unclassified report

Pub. in Medical Annals of the District of Columbia v34 n2 p64-8 Feb 1965
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Radiotherapy, Kidneys), (*Kidneys, Pathology), (*Radiation effects, Kidneys), Radiation hazards, Histological techniques, X rays, Diseases.

Three cases of acute radiation nephritis have been reported. All 3 patients died within 8 months after radiotherapy to the kidney area, 2 with symptoms of renal failure and the third from other causes. All 3 showed similar renal lesions at autopsy. Pathologically 2 types of changes were observed: (a) atrophy of tubules, fibrosis of the parenchyma, and sclerosis of the vessels, indicating an older process, and (b) a superimposed severe alteration of the glomerular loops, which suggested degenerative changes in the endothelium. (Author)

AD-613 804 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
BASOPHILIC MUCOID DEGENERATION OF THE HEART,
by William C. Manion. 1964, 4p

Unclassified report

Pub. in Medical Annals of the District of Columbia n34 n2 p60-3 Feb 1965.
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Cardiovascular diseases, Histological techniques), (*Heart, Pathology), (*Histological techniques, Heart), Epilepsy, Muscles, Cytoplasm, Diseases, Diagnosis, Colloids, Tissues (Biology), Carbohydrates, Metabolism, Morphology (Biology).

The historical background, microscopic appearance, and staining reaction of basophilic mucoid degeneration of the heart are presented, and another instance of its occurrence in progressive myoclonic epilepsy is reported. Some progress was made in subdividing the lesions according to their staining properties after phosphorylation, but further study of the lesions as they occur in association with different diseases is necessary. The possibility that the occurrence of these lesions in the heart in progresssive myoclonic epilepsy may represent an enzymatic depression of carbohydrate metabolism has been suggested but not clinically proven. Investigative studies of this common lesion are to be encouraged. (Author)

AD-613 805 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
EFFECT OF TETRACYCLINES ON DENTITION,
by Henry H. Scofield. 1963, 5p

Unclassified report

Pub. in Medical Annals of the District of Columbia v34 n2 p56-60 Feb 1965
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Tetracyclines, Teeth), (*Teeth, Tetracycline), Antibiotics, Pharmacology, Pathology, Children, Infants, Pregnancy, Drugs, Dosage.

Administration of the tetracyclines, i.e., oxytetracycline, chlortetracycline, and tetracycline, during the period of tooth development may be associated with discoloration of the teeth and hypoplastic defects in the enamel. The discoloration and hypoplasia are related to the deposition of the antibiotics in the developing dentin and enamel, where their presence may be demonstrated as golden-yellow fluorescent bands in ground sections of the teeth examined under ultraviolet light. These drugs may also cross the placental barrier and affect the developing teeth. Cases have been reported in which children whose mothers received tetracycline during pregnancy had yellow deciduous teeth. There is as yet no relevant information about the effect of demethylchlortetracycline on the teeth, as there have been no recorded instances of discoloration or hypoplasia related to the administration of this drug. (Author)

AD-613 806 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
STRUCTURAL CHANGES IN THE THYROID GLANDS OF HEALTHY YOUNG MEN,
by J. E. Oertel and G. H. Klinck. 1964, 3p
Unclassified report

Pub. in Medical Annals of the District of Columbia v34 n2 p75-7 Feb 1965
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Thyroid gland, Morphology (Biology)), Males, Aging (Physiology), Histological techniques, Diseases, Weight, Neoplasms, Cancer, Pathology, Lymphocytes.

Morphologic observations have been made on the thyroid gland of 137 young healthy men who died unexpectedly. The median weights of the glands increased from 17 Gm. in the 15- to 19-year group to 21.7 Gm. in the 35- to 39-year group. Thyroid glands without nodules constituted 87 per cent of the glands examined. Eighteen glands were the site of lymphocytic infiltrates, only 3 of which could justifiably be diagnosed as lymphocytic thyroiditis. One minute occult carcinoma was found. (Author)

AD-613 807 Div. 16

Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
MODIFICATION OF THERMOREGULATORY RESPONSES TO COLD BY HYPNOSIS.
Final rept. for Sep 62-Apr 63,
by Abbott T. Kissen, Clifford B. Reifler, and Victor H. Thaler. 12 Mar 64, 12p AMRL-TR-65-21
Proj. 7164, Task 716409 Unclassified report
Pub. in Journal of Applied Physiology (U. S.) v19 n6 p1043-50 Nov 1964 (Copies not available to DDC or Clearinghouse customers).
Presented in part at the meeting of The American Psychosomatic Society, 4 Apr 64, San Francisco, Calif.

Descriptors: (*Body temperature, Adaptation (Physiology)), (*Acclimatization, Exposure), Cold weather tests, Protective clothing, Attention, Performance (Human), Stress (physiology), Psychophysiology.

The effects of hypnosis on thermoregulatory responses were studied in non-acclimatized acutely cold-exposed men. Forty exposures (4.5 to 5C) were conducted in an environmental chamber under both hypnosis and non-hypnosis conditions. Five subjects, wearing I clo insulation, were cold exposed for I hr, four times for each condition, and each subject served as his own control. Variables monitored included mean skin and rectal temperatures, heart and shivering rates, basal skin resistance, and vigilance task performance. In hypnosis, shivering was suppressed, heart rate lowered, and vigilance task performance improved. Basal skin resistance differed in terms of pattern and level, being generally higher under hypnotic conditions. Rectal temperatures were lower despite maintaining skin temperature at the same level as during nonhypnosis conditions. These findings indicate that with the thermal stress imposed and levels of trance achieved, there is a general amelioration of the psychophysiological effects of the stress. The mechanism responsible for this form of 'adaptation' remains speculative but is consistent with generalized suppression of sympathetic activity. (Author)

AD-613 809 Div. 16

Naval Medical Research Unit no. 2, Taipei (Taiwan).
SCRUB TYPHUS IN THE PESCADORES ISLANDS: AN EPIDEMIOLOGIC AND CLINICAL STUDY,
by W. C. Cooper, J. C. Lien, S. H. Hsu, and W. F. Chen. 1963, 7p Research rept. MR-005.09-1601.3.16
Unclassified report

Pub. in American Journal of Tropical Medicine and Hygiene (U. S.) v13 n6 p833-8 Nov 1964
Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Far East, Epidemiology), (*Rickettsia tsutsugamushi, Epidemiology), (*Epidemiology, Ricketttsia tsutsugamuski), (*Disease vectors, Rickettsia tsutsugamushi), Diseases, Microbiology, Mites, Medical examination, Diagnosis, Etiology.

Studies on scrub typhus conducted during 1962 in the Pescadores Islands revealed that a major mite vector for the disease is Leptotrambidium deliensis. Infected mites were found most often in cover provided by miscanthus and coral walls along field margins. The shrew, Suncus murina, was the host most commonly infested with infected mites. Rattus norvegicus and Rattus rattus refescens were less important sources. The percentage of infected mites appeared to increase until late summer, than to decline, and to increase again in November. However, the data are insufficient to permit a definite conclusion concerning seasonal cycles. Five of 103 reported cases of scrub typhus in 1962 were studied. Rickettsia orientalis was isolated from whole blood of all five patients. None of them had skin rash, but in other respects their illness was similar to established clinical descriptions of the disease as it occurs in Southeast Asia. (Author)

AD-613 822 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
AN IMPROVED BIOPSY TECHNIQUE FOR LIGHT AND ELECTRON MICROSCOPIC STUDIES OF HUMAN SKELETAL MUSCLE,
by Harold M. Price, Edward L. Howes, Jr., David B. Sheldon, Oliver D. Hutson, and Robert T. Fitzgerald. 11 Nov 64, 6p
Proj. 3A012501B813 Unclassified report

Pub. in Laboratory Investigation (U. S.) v14 n2 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Histological techniques, Muscles), (*Muscles, Histological techniques), Musculoskeletal system, Humans, Tissues (Biology), Surgical instruments, Surgical techniques, Electron microscopy.

In order to overcome handicaps in handling muscle tissue for histological examination, a new biopsy procedure was devised and used successfully in 30 patients. Well-fixed, uniform, interpretable tissue sections were obtained for either electron microscopic or light microscopic evaluation. The biopsy procedure is primarily dependent on the use of a new surgical clamp which is in essence a modified forceps with a handle made of the usual surgical spring steel and a two-pronged fork tip of a firmer, highly corrosion-resistant stainless steel that is not chemically affected by the fixative osmium tetroxide. It has a set-screw at the midpoint of the handle which makes it possible to permanently retain the specimen and prevent it from retracting once it has been clamped and dissected free.

AD-613 826 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.

THE RECTAL MUCOSA AS A BIOLOGIC INDICATOR OF RADIATION INJURY. I. PRELIMINARY CYTOPATHOLOGIC OBSERVATIONS,
by David C. White and Ronald L. Persing.
1963, 8p Unclassified report
Contract WEB03 102

Pub. in Medical Annals of the District of Columbia v34 n2 p68-74 Feb 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Radiation effects, Tissues (Biology)), (*Gastrointestinal system, Radiation injuries), (*Radiation injuries, Histological techniques), Radiotherapy, Mucus, Membranes (Biology), Radiological dosage, Dosimeters, Exposure, X-rays, Cells (Biology), Pathology, Hematology.

The ever-increasing employment of high-energy penetrating radiation dictates the necessity of highly efficacious means of determining the extent of biologic injury incurred when an individual is exposed to excessive quantities of ionizing radiation. Present physicochemical dosimetric systems are generally capable of defining the magnitude of radiation at a specific point in space but fail to reflect the reaction of the biologic system that absorbs this energy. Clinical signs and symptoms suggest the degree of injury, especially when all or most of the body has received this trauma. Hematologic analysis provide generally reliable indices of total dose received and the post-exposure time period but should be augmented by additional biologic indicators when feasible. The characteristic morphologic alterations induced by radiation in the mucosa of the rectum as investigated by biopsy techniques provide a specific post-exposure timetable of histopathologic events and a roughly quantitative relationship to total dose. (Author)

AD-613 827 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
FIBROUS HAMARTOMA OF INFANCY,
by Franz M. Enzinger. 8 Jun 64, 8p
Unclassified report

Pub. in Cancer (U. S.) v18 n2 p241-8 Feb 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Infants, Neoplasms), (*Neoplasms, Infants), Tissues (Biology), Morphology (Biology), Histological techniques, Pathology, Anomalies, Birth, Males, Medical examination, Diagnosis, Etiology, Excision.

The pathologic and clinical features of 30 cases of a distinctive fibrous tumor occurring in infants were analyzed. Characteristically, the tumor showed a prevalence for the male sex and affected principally the subcutaneous tissue of the axilla, shoulder, and upper arm. In most patients the tumor was discovered during the first 12 months of life and in 5 it was noticed at birth. The striking microscopic picture varied but little from patient to patient and consisted mainly of a complex organoid mixture of dense fibrous trabeculae, areas of loosely arranged and immature-appearing cells, and fat. The criteria for diagnosis and the possible etiologic factors are discussed, and the designation of 'fibrous hamartoma of infancy' is suggested. Judging from the follow-up information in 25 of the patients, the clinical course is essentially that of a benign tumor; hence, complete local excision seems to constitute adequate therapy. (Author)

AD-613 832 Div. 16

Chicago Univ., Ill. Medical School.
HEMOLYTIC EFFECT OF PRIMAQUINE. XVII. HEXOKINASE ACTIVITY OF GLUCOSE-6-PHOSPHATE DEHYDROGENASE-DEFICIENT AND NORMAL ERYTHROCYTES,
by George J. Brewer, Robin D. Powell, Shirley H. Swanson, and Alf S. Alving. 13 Sep 63, 12p
Contract DA49 193MD2413
Unclassified report

Pub. in Journal of Laboratory and Clinical Medicine (U. S.) v64 n4 p601-12 Oct 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Cinchona alkaloids, Hemolysis), (*Saccharide phosphates, Deficiency diseases), (*Erythrocytes, Blood diseases), Oxidoreductases, Enzymes, Drugs, Glutathione, Anemias, Hematocrit.

The activity of the sulfhydryl-dependent enzyme, hexokinase, was studied during hemolytic drug administration, in the erythrocytes of glucose-6-phosphate dehydrogenase-deficient Negroes. The content of reduced glutathione in these erythrocytes is known to be low and to decrease further during primaquine-induced hemolytic anemia. The activity of hexokinase did not decrease in enzyme-deficient erythrocytes during the critical period from 2 to 5 days after the start of primaquine administration; this is the period during which the content of reduced glutathione has decreased but the hematocrit has not undergone its major fall, indicating that most of the erythrocytes damaged by drug are still in the circulation. The lack of any change in hexokinase activity during this period is evidence against irreversible inactivation of hexokinase resulting from depletion of reduced glutathione, and fails to implicate involvement of this enzyme in the mechanism of drug induced hemolysis. The activity of hexokinase in enzyme-deficient red cells prior to drug administration was significantly greater than that in normal erythrocytes. Further, during intense reticulocytosis following drug-induced hemolytic anemia or acute blood loss, the activity of hexokinase increased markedly. (Author)

AD-613 836 Div. 16

Washington Univ., Seattle.
POLYCHAETOUS ANNELIDS FROM PUGET SOUND AND THE SAN JUAN ARCHIPELAGO, WASHINGTON,
by Karl Banse. 1964, 12p
Technical rept. no. TR-105
Contract Nonr47710, Proj. NR083 012
Unclassified report

Pub. in Biological Society of Washington. Proceedings (U. S.) v76 p197-208 Dec 31 1963(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Annelida, Morphology (Biology)), (*Puget sound, Annelida), Washington (State), Biology.

In view of pending investigations of the level bottom fauna of the inshore waters of Washington by the Department of Oceanography, polychaetes were studied at the Friday Harbor Laboratories of the University of Washington during the summers of 1961 and 1962. Some species new to the area or new to science are treated here. (Author)

AD-613 848 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.

THE EFFECT OF HYDRAZINE AND CONGENERS ON C(14)02 RESPIRATORY PATTERN OF VARIOUS METABOLIC SUBSTRATES,
by Joseph S. Amenta and Abel M. Dominguez.
23 Dec 63, 11p Unclassified report
Contract NASA A31086
Pub. in Toxicology and Applied Pharmacology v7 n2 p236-46 Mar 1965.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Hydrazine, Metabolism), (*Toxicity, Hydrazine), (*Hydrazine derivatives, Metabolism), Dimethyl hydrazine (1-1), Methyl hydrazines, Respiration, Amino acids, Oxidation, Labeled substances, Test methods, Rats.

A method is described that permits a rapid screening of oxidative pathways that may be affected by toxic chemicals in the intact animal. A large amount of nonlabeled substrate, added to the labeled substrate, is injected intravenously into rats, and expired C14O2 is collected for three half-hour intervals directly into vials containing a combined trapping-scintillator solution. Sinificant differences were obtained in the ability of hydrazine-treated animals to oxidize glycine-1-C(14)O2 as compared with control animals similarly tested. No differences were found in the ability of these hydrazine-treated rats to oxidize acetate-1-C(14)to C(14)O2. These findings agree with previous invitro studies. Similar observations were noted with the hydrazine derivatives monomethyl hydrazine (MMH), 1,1-dimethylhydrazine (UDMH), and, to a lesser degree, with 1,2-dimethyl-hydrazine (SDMH) and iproniazid. The conversion of glucose-C(14)(UL) to C(14)O2 was depressed in hydrazine- and UDMH-treated rats. The large loading dose, in contrast to that used in studies in which only a small amount of substrate was injected into the animal, manifests to a much greater degree the depression in the amino acid oxidation effected by the toxic chemicals. Intra-group variation of the data is also significantly reduced by this loading technique. (Author)

AD-613 860 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
BLOOD COAGULATION CHANGES AFTER SHOCK AND TRANSFUSION OF INCOMPATIBLE BLOOD,
by Robert M. Hardaway. 1964, 18p
Unclassified report

Pub. in New York Academy of Sciences. Annals (U. S.) v115 n1 p151-68 Jul 9 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Shock (Pathology), Blood coagulation), (*Blood coagulation, Blood transfusions), Prothrombin, Thrombin, Fibrinogen, Heparin, Plasmin, Blood platelets, Hemorrhage, Blood circulation, Toxins and antitoxins, Compatibility.

Conclusions: (1) Thrombin, incompatible blood and bacterial endotoxin and other types of shock cause intravascular coagulation of blood in the microcirculation. (2) This process uses up blood clotting elements including platelets, fibrinogen, Factors V and VII, and others. (3) As a protective response to the intravascular coagulation, the body activates endogenous heparin and fibrinolysin in an attempt to halt and reverse the clotting process. (4) Clinical bleeding may result from any or all of the above. (Author)

AD-613 861 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
A COMPARATIVE STUDY OF RESPONSE OF SPECIES TO PERIPHERAL-NERVE INJURY. II. CRUSH AND SEVERANCE WITH PRIMARY SUTURE,
by David G. Kline, George J. Hayes, and Arthur S. Morse. 12 Dec 63, 10p
Unclassified report

Pub. in Journal of Neurosurgery (U. S.) v21 n11 p980-8 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Peripheral nervous system, Wounds and injuries), (*Nerves, Surgical techniques), (*Nerve cells, Regeneration), Adaptation (Physiology), Histological techniques, Connective tissue, Dogs, Monkeys, Chimpanzees, Primates.

Multiple peripheral nerves in a series of dogs, rhesus monkeys, baboons, and chimpanzees were injured by crush or by severance with primary suture repair. Differences of species in response to a crush injury were minimal and consisted of a comparative increase in connective tissue and slower distal tubular remyelination in the chimpanzee than in the other species. Axonal counts distal to the crush injury, however, did not vary significantly among the species studied. Differences of species in response to severance and suture were more apparent than in the crush series. Connective-tissue proliferation and axonal disorganization in the area of repair were most marked in the chimpanzee. Remyelination of the distal segment and restoration of a functional threshold of conduction in the sutured nerves of the chimpanzee also lagged behind that of the other species. Axonal counts of the proximal and distal stumps were compared. Axonal counts of the distal stumps of specimens removed 6 weeks after severance and suture were most concentrated in the dog and the rhesus monkey. Comparison of the axonal counts in the distal stump made at 8 and 14 weeks, however, showed no differences of species. Since differences of species in response to peripheral-nerve injury exist, it may be of value to test new techniques of peripheral-nerve repair on higher primates before attempting them on the human. (Author)

AD-613 865 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
THE EFFECTIVENESS OF SOME TRADITIONAL METHODS IN ORAL HYGIENE NURSING CARE,
by Miriam K. Ginsberg and Anne E. Yoder.
Dec 64, 6p
Unclassified report

Pub. in Journal of Periodontology (U. S.) v35 p513-8 Nov-Dec 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Dentistry, Hospitals), (*Hospitals, Dentistry), Teeth, Mouth, Nurses, Effectiveness, Ulcers, Drugs, Therapy, Guinea pigs.

A study of oral hygiene procedures commonly used by hospital nurses was conducted on oral lesions produced experimentally in guinea pigs. Each of six local measures was used in combination with three types of systemic treatments. Lack of any systemic treatment and placebo local measures with placebo systemic treatments, were used as controls. The effective rate of animals developing the lesions was fifty per cent. The local and systemic methods of treatment did not differ significantly in their effect on the induced oral lesions in animals. This method of animal experimentation did not measure whether the treatments relieved pain and discomfort, factors which are of importance in the care of patients. (Author)

AD-613 874 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
INTRAPERITONEAL ANTIBIOTIC ADMINISTRATION: RATE OF ABSORPTION ACROSS NORMAL PERITONEUM,
by Leroy Shear, Robert E. Blount, Jr., Raymond C. Doberneck, and Kevin G. Barry. 1965, 7p
Unclassified report

Pub. in American Journal of the Medical Sciences (U. S.) v249 n1 p27-33 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Peritoneum, Absorption (Biological)), (*Antibiotics, Injection(Medicine), Tissues (Biology), Histological techniques, Toxicity, Penicillins, Streptomycins, Chlortetracycline, Therapy, Rabbits.

Changes in serum concentration of penicillin, methicillin, streptomycin and chlortetracycline were studied following intraperitoneal administration in normal rabbits. Blood levels within the therapeutic range were observed at initial sampling one hour following administration. Thereafter, rates of clearance from the blood were similar to those reported following intravenous or intramuscular administration. Histologic study following repeated intraperitoneal injections failed to reveal evidence of significant local toxicity. Intraperitoneal administration appeared to be a safe means of achieving serum antibiotic concentrations in the therapeutic range. Results suggest that in some humans with severe systemic infection, intraperitoneal antibiotic administration may be of value. (Author)

AD-613 875 Div. 16

Kent State Univ., Ohio.
THE SWIMMING CAPACITY OF THE GOLDEN HAMSTER,
by Charles G. Wilber. 20 Jul 62, 4p
Contract DA49 193MD2216
Unclassified report

Pub. in Journal of Mammalogy (U.S.) v44 n2 p265-7 20 May 1963
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Hamsters, Swimming), Body weight, Physiology, Time.

AD-613 876 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
MUCOPOLYSACCHARIDES IN MAST CELLS AND MASTOCYTOSIS,
by James G. Zimmer, Bruce M. McAllister, and D. Joseph Demis. 30 Jan 64, 5p
Unclassified report

Pub. in Journal of Investigative Dermatology (U. S.) v44 n1 p33-7 Jan 1965 (Copies not available to DDC or Clearinghouse customers).
Rept. presented at the Annual Meeting of the Society for Investigative Dermatology, Inc. (24th), Atlantic City, N. J., 18 Jun 63.

Descriptors: (*Mucopolysaccharides, Cells (Biology)), Heparin, Connective tissue, Pathology, Urine, Histamine, Neoplasms, Blood coagulation, Chromatographic analysis, Electrophoresis.

A study of 37 cases of mastocytosis revealed no hypocoagulability or other clinical evidence of a significant increase in circulating heparin, with the possible excretion of one case. Analysis of 24-hour urine specimens from 21 patients showed normal amounts of total mucopolysaccharide. Paper chromatography and electrophoresis of urine from 10 patients did not demonstrate the presence of heparin. Analysis of random serum samples from 7 patients revealed no increase in blood mucopolysaccharide level. These findings and a review of the literature support the concept that, in spite of the great increase in the heparin-containing mast cells in mastocytosis, heparin, unlike histamine, is only rarely released from the mast cells into the circulation in clinically significant amounts. (Author)

AD-613 877 Div. 16

Walter Reed Army Inst. of Research, Washington, D.C.
PATHOGENESIS OF BACILLARY DYSENTERY IN LABORATORY ANIMALS,
by Samuel B. Formal, E. H. LaBrec, and H. Schneider. 1964, 6p
Unclassified report

Pub. in Federation Proceedings (U. S.) v24 n1 ptI p29-34 Jan-Feb 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Dysentery, Laboratory animals), Guinea pigs, Starvation, Shigella flexneri, Enterobacteriaceae, Escherichia coli, Carbon tetrachloride, Intestines, Liver, Pathology, Diarrhea, Toxicity, Histological techniques, Toxins and antitoxins.

An attempt was made to study the bacillary dysentery infection in small laboratory animals in the hope that the findings obtained under these artificial conditions might give some hints on the disease process as it occurs in nature. While normal guinea pigs exhibit little or no reaction after oral administration of virulent dysentery bacilli followed by an intraperitoneal injection of opium, animals which have been deprived of food for 4 days usually die after being fed the bacteria, providing a drug such as opium is injected. It is this experimental model, the infected starved guinea pig, which is characterized the findings obtained from it are then related to the natural infection. Histologic examination of the major organs of starved guinea pigs revealed that the only consistent change brought about by the starvation procedure was a centrilobular fatty degeneration of the liver. This striking change led to the use of a common chemical, hepatotoxin, in an attempt to reproduce the same pathological changes. It was found that a subcutaneous injection of a sublethal dose of carbon tetrachloride could substitute for the starvation period. If a small dose of carbon tetrachloride was given, 24-48 hr prior to oral challenge with dysentery bacilli, the pattern of death and pathological changes in the intestinal tract were the same as those seen in animals which had been starved.

AD-613 878 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
PERITONEAL DIALYSIS: INDWELLING CANNULA PERMITS INTERMITTENT DIALYSIS WITHOUT REPEATED PARACENTESIS,
by K. G. Barry, J. L. Sherman, F. D. Schwartz, and T. E. Davis. 1964, 8p
Unclassified report

Pub. in Postgraduate Medicine (U. S.) v37 n2 p226-33 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Peritoneum, Cannulation), Medical equipment, Surgical techniques.

Peritoneal dialysis has achieved a prominent position in treating renal failure and other homeostatic imbalance. This exhibit illustrates a device which permits repeated dialysis following a single paracentesis and presents modifications of technic which simplify the procedure. Graphic case histories illustrate the benefit of dialysis in diverse conditions characterized by homeostatic imbalance. (Author)

AD-613 879 Div. 16

Walter Reed Army Inst. of Research, Washington, D. C.
SYSTEMIC AND CORONARY ENERGETICS IN THE RESTING UNANESTHETIZED DOG,
by Donald E. Gregg, Edward M. Khouri, and Claudia R. Rayford. 3 Aug 64, 13p

Unclassified report

Pub. in Circulation Research (U.S.) v16 p102-13 Feb 1965
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Blood circulation, Flowmeters), (*Flowmeters, Medical equipment), (*Heart, Blood circulation), Blood pressure, Aorta, Metabolism, Relaxation (Physiology), Pulse rate, Oxygen consumption, Cardiovascular system, Dogs.

This report is an initial attempt to study the coronary circulation in the chronic unanesthetized dog. A standardized preparation has been developed in which phasic aortic pressure and flow, phasic left coronary inflow, and myocardial metabolism have been studied for many weeks in the unanesthetized dog under resting conditions. The flow patterns in the main left coronary artery and in its major branches are very similar. In the resting dog, the left coronary inflow during systole is 7 to 45% of that during diastole. We believe that much of this flow into the epicardial arteries penetrates into the myocardium. Stroke coronary flow can change considerably without significant alterations of blood pressure and heart rate. Despite this, the coronary flow values (37 to 58 cc) and oxygen usage values (4.4 cc to 8.6 cc) per 100 grams left ventricle per minute are low. Since, however, these measurements can vary considerably not only in different dogs but also in the same dog on the same day, and from day to day, it is suggested that these animals were in a semiresting state and probably not in a basal state. (Author)

AD-613 880 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
POWER LAWN MOWERS AS A SOURCE OF OCULAR INJURIES,
by Robert H. Fenton. 1964, 3p

Unclassified report

Pub. in American Journal of Ophthalmology (U. S.) v59 n2 np Feb 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Eye, Wounds and injuries), (*Power equipment, Hazards), Medical examination, Pathology, X rays, Penetration.

A case of a penetrating injury of the eye with retention of an intraocular ferrous foreign body is presented. The metallic foreign body was projected into the eye as a missile thrown by a rotary power lawn mower. The widespread use of these mowers represents a new and increasingly important source of ocular injuries. It is incumbent on the physicians to consider this in his differential diagnosis of ocular injuries, and to keep in mind the possibility of an intraocular foreign body in all cases in which an injury has resulted in a penetrating wound of the eye. (Author)

AD-613 899 Div. 16

Army Biological Labs., Frederick, Md.
MICROBIOLOGICAL SAFETY EQUIPMENT,
by Joseph V. Jemski and G. Briggs Phillips. 1963, 12p

Unclassified report

Pub. in Laboratory Animal Care (U. S.) v13 n1 p2-12 Feb 1963 (Copies not available to DDC or Clearinghouse customers).
Presented at the Annual Meeting of the Animal Care Panel (12th) (Symposium on Biological and Radiological Safety in the Animal Laboratory), Sep 27-29 1961, Boston, Mass.

Descriptors: (*Biological laboratories, Safety), Medical personnel, Immunity, Disease vectors, Infectious diseases, Bacteria, Laboratory equipment, Laboratory animals, Germicides, Biological contamination, Hazards.

A program for laboratory safety must consist of the firm establishment of clearly stated principles, the education of all personnel in safety operations, the immunization of personnel where applicable, and the proper application of safety equipment. Most of the procedures and equipment for the animal laboratory discussed in this presentation have been proved by actual practice over many years of tests with highly communicable disease agents. Many will counter that the methods and equipment may be too difficult or to expensive to use. However, it was not too long ago that the ultra high speed centrifuge and the electron microscope were considered too expensive and exotic. Today this equipment is found in the majority of laboratories. If one pro-rates the advances made possible by the use of equipment which allows for almost unlimited flexibility and scope of work with infectious agents, it can only be concluded that the real expenses, materially and morally, are the medical and psychic costs incurred with occupational infections occur among laboratory personnel. (Author)

AD-613 901 Div. 16

Army Biological Labs., Frederick, Md.
CONTROL OF LABORATORY AIRBORNE INFECTION,
by Arnold G. Wedum. 1961, 7p

Unclassified report

Pub. in Bacteriological Reviews (U. S.) v25 n3 p210-6 1961 (Copies not available to DDC or Clearinghouse customers).
Presented at the Conference on Airborne Infection, National Academy of Sciences-National Research Council, held in Miami Beach, Fla., Dec 7-10 1960.

Descriptors: (*Biological laboratories, Safety), (*Infections, Airborne), Microbiology, Microorganisms, Laboratory equipment, Protective clothing, Medical personnel, Germicides, Vaccines, Sewage, Training, Control.
Contents:
Microbiological technique
Engineering and equipment
Vaccination.

AD-613 909 Div. 16

Armed Forces Inst. of Pathology, Army Medical Center, Washington, D. C.
SQUAMOUS CELL CARCINOMA AND ADENOACANTHOMA OF THE STOMACH. A CLINICOPATHOLOGIC STUDY,
by J. Thornton Boswell and Elson B. Helwig.
23 Jun 64, 12p

Unclassified report

Pub. in Cancer (U. S.) v18 n2 p181-92 Feb 1965
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Cancer, Stomach), Cells (Biology), Pathology, Diagnosis, Surgery, Histological techniques.

Twenty-three patients with carcinomas having a squamous component were studied pathologically to confirm the presence of a squamous component, their origin, and their clinical behavior. Forty-three patients with similar squamous cell-containing carcinomas are tabulated from the literature. The presence of a squamous element was confirmed histologically on the basis of the presence of polygonal cells with intercellular bridges, well-formed or early formation of keratin pearls with individual cell keratinization. The latter was confirmed by the presence of a higher concentration of sulfhydryl groups than in the adjacent glandular epithelial cells. Of the 12 patients with pure squamous cell carcinoma of the stomach, 8 had follow-up data of sufficient duration for adequate evaluation. All of these patients died within 7 months or less from the time of diagnosis, and all but one had metastasis and death was attributed to the tumor. Of the 11 patients with adenoacanthoma, 8 died with metastases, 1 other had metastasis at the time of surgical operation; of the remaining 2, 1 was lost to follow-up and 1 was too recently diagnosed for follow-up evaluation. The occurrence of benign squamous cell metaplasia and papillomatosis is confirmed, and these conditions are suggested as a possible origin of the adenoacanthoma and squamous cell carcinoma of the stomach. (Author)

17. Metallurgy

AD-613 160 Div. 17
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ON THE PROBLEM OF THE NATURE OF THE HARDENING OF AUSTENITE STEELS,
by V. I. Grigorkin. 18 Mar 65, 16p
FTD-TT-64-705
TT 65-61857
Unclassified report

Unedited rough draft trans. of Izvestiya Vysshikh Uchebnykh Zavedenii. Chernaya Metallurgiya (USSR) 1963, v. 6, no. 2, p. 95-103.

Descriptors: (*Steel, Hardening), (*Hardening, Steel), Austenite, Maganese alloys, Nickel alloys, Chromium alloys, Crystal structure, Deformation, Elasticity, Crystal lattice defects, Phase studies, USSR.

A study was made of the peculiarities (connected with a degree of cold hardening) of the plastic strain in austenite steels under conditions of different temperatures. The changes in the thin crystalline structure (breaking down the blocks and the formation of microstrains) and the phase situation with plastic strain separate made it possible to evaluate the action of the factors on the strength of single-phase solutions of steel of the austenite class.

AD-613 181 Div. 17
CFSTI Prices: HC$1.00 MF$0.50

Stanford Univ., Calif. Dept. of Materials Science.
ELASTIC PROPERTIES OF A TUNGSTEN-SILVER COMPOSITE ABOVE AND BELOW THE MELTING POINT OF SILVER,
by S. Umekawa, R. Kotfila, and O. D. Sherby.
15 Feb 65, 13p Technical rept. no. TR-5 SU-DMS-65-9
Contract Nonr22560, Proj. NR031 682
Unclassified report

Descriptors: (*Tungsten, Composite materials), (*Composite materials, Tungsten), (*Silver, Composite materials), Elasticity, Transition temperature, Melting, Porous metals, Impregnation, Phase studies, Temperature, Microstructure.

The dynamic Young's modulus of a composite of tungsten containing twenty volume percent silver was evaluated up to 1020C. In the temperature range 25C to 800C, it was shown that the temperature dependence of the modulus as well as the absolute value of the modulus is closely approximated by the upper bound theory of Hashin and Shtrikman. Above 800C the modulus decreases much more rapidly than predicted by the theory. This rapid drop in modulus is believed to be associated with interphase boundary shearing between the tungsten and silver phases. A large discontinuity in modulus (over 10% change) is observed at the melting point of silver. Above the melting point of silver the modulus of the composite is about equal to the modulus of a tungsten sample containing an equivalent percentage of pores suggesting that there is no strengthening of tungsten from the presence of molten silver. (Author)

AD-613 182 Div. 17
CFSTI Prices: HC$2.00 MF$0.50

Stanford Univ., Calif. Dept. of Materials Science.
YOUNG'S MODULUS OF EUTECTIC ALLOY SYSTEMS WITH SPECIAL EMPHASIS ON THE SILVER-LEAD SYSTEM,
by S. Umekawa and O. D. Sherby. 1 Mar 65, 26p Technical rept. no. TR-6, SU-DMS-65-14
Contract Nonr22560, Proj. NR031 682
Unclassified report

Descriptors: (*Elasticity, Eutectics), (*Eutectics, Alloys), (*Silver alloys, Lead alloys), (*Lead alloys, Silver alloys), Phase studies, Microstructure, Temperature, Measurement.

The dynamic Young's modulus - composition relation in eutectic alloy systems, without terminal solid solubility, follows either a linear relation or a less than linear relation. Essentially linear relations are obtained for systems where the moduli differences between the two phases are small or when the microstructure of the alloy exhibits a strong fibered texture such as is obtained in a cold drawn material. Eutectic systems containing a random distribution of phases with large moduli differences between the phases exhibit less than linear relations between modulus and composition. The theory of Hashin and Shtrikman is in qualitative agreement with experimental data obtained in the Ag-Pb system. Quantitatively, the actual modulus values of the composite are higher than the predicted values. This discrepancy may be due to the presence of internal stresses at the Ag-Pb interface which factor is not taken into consideration in the Hashin-Shtrikman theory. (Author)

AD-613 254 Div. 17

Purdue Univ., Lafayette, Ind.
ELECTRICAL RESISTIVITY OF DILUTE ALLOYS OF MAGNESIUM AND NEODYMIUM,
by K. B. Das and A. N. Gerritsen. 4 Jun 62, 3p
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n11 p3301-4 Nov 1962 (Copies not available to DDC or Clearinghouse customers)
Supported in Part by a U. S. Signal Corps contract and Research Corporation grant.

Descriptors: (*Magnesium alloys, Resistance (Electrical)), (*Neodymium alloys, Resistance (Electrical)), Temperature, Measurement, High temperature research, Low temperature research, Differential equations.

The electrical resistivity of magnesium at room temperature was found to increase by 1.47 ±0.37 micro-ohms cm per atomic percent addition of neodymium. The additional resistivity is strongly temperature dependent between 77 and 373K. In the temperature range 273 to 373K the temperature dependence of the additional resistivity can be characterized by a temperature coefficient of the order -.002/deg. (Author)

AD-613 371 Div. 17
CFSTI Prices: HC$2.00 MF$0.50

Case Inst. of Tech., Cleveland, Ohio. Dept. of Metallurgy.
INTERFACE MOTION IN PHASE TRANSFORMATIONS. TRANSFORMATIONS IN IRON AND IRON-9 PERCENT NICKEL ALLOYS,
by R. H. Goodenow and R. F. Hehemann. Mar 65, 40p
Technical rept. no. TR-3
Contract Nonr114115, Proj. NR031 698
Unclassified report

Descriptors: (*Steel, Phase studies), (*Iron, Phase studies), Iron alloys, Surface properties, Martensite, Bainite, Microstructure, Transition temperature,

Crystal lattice defects, Grain boundaries, Transformation, Nickel alloys.

Thermal arrest, hot stage microscopy and transmission electron microscopy techniques have been employed to study the transformations in low carbon iron and iron-9% nickel alloys. In continuous cooling experiments, both series of alloys transform at an essentially constant temperature for cooling rates below the critical rate required for martensite formation. However, the high temperature transformation in pure iron takes place by a different mechanism than that in the 9% nickel alloys. Pure iron exhibits an equiaxed alpha structure with a low and random dislocation density while the 9% nickel alloy exhibits a cell like substructure analogous to that of low carbon martensite. This same cell like substructure characterizes upper bainite in higher carbon materials. (Author)

AD-613 454 Div. 17
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF FORMING A CUTTING CAVITY BY CHARGES WITH A CUMULATIVE EFFECT,
by V. F. Vedutin. 22 Mar 65, 5p FTD-TT-64-1191
TT 65-61945

Unclassified report

Unedited rough draft trans. of Russian patent 160,975, appl. no. 807,041/22-3, 7 Dec 62.

Descriptors: (*Mining engineering, Charges (Explosives), (*Charges (Explosives), Mining engineering), Explosion effects, Preparation, Design.

The object of the invention is a method of forming a cutting cavity by charges of cumulative action. To increase the efficiency of the blast hole and to lower the expenditure of explosives, the blast holes for the cumulative charges are arranged more or less in a circle, and more or less in the center there is located the blast hole for the regular charge. The cumulative charges in the blast holes are mainly arranged from the coal face to the middle of the length of the blast hole, and the regular charge from the middle up to the mouth of the blast hole. The cumulative charges are exploded at the same time and with a delay with relation to the explosion of the center blast hole.

AD-613 534 Div. 17
CFSTI Prices: HC$2.00 MF$0.50

Research Chemicals Div., Nuclear Corp. of America, Burbank, Calif.
INVESTIGATION OF THE APPLICATION OF ELECTRIC CURRENT DURING ZONE REFINING.
Rept. for Dec 59-60,
by Louis L. Thomas. Jul 61, 49p
Contract AF33 616 6150, Proj. 7371, Task 73711
WADD TR-61-90; PB 181 114

Unclassified report

Descriptors: (*Zone melting, Electric currents), Germanium, Impurities, Purification, Resistance (Electrical), Mathematical analysis.

An investigation of the effects of axial direct current during a zone refining process has been continued. Optimum current direction and limiting current densities have been established. Results for germanium indicate that the segregation rate is increased when the current flows opposite to the direction of zone travel, and is decreased when the current is reversed. The magnitude of the effect is larger than the theoretical rate of diffusion of ions in an electric field, and the optimum current direction is opposite to that predicted from considerations of interface stability due to the Peltier effect. (Author)

AD-613 558 Div. 17
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
LOW CYCLE FATIGUE CRACK PROPAGATION CHARACTERISTICS OF MONEL 400 AND MONEL K-500 ALLOYS.
Final rept.,
by T. W. Crooker, R. E. Morey, and E. A. Lange.
10 Mar 65, 16p Rept. no. NRL-6218
Projs. RR007 01 46 5420, SR007 01 01 0856

Unclassified report

Descriptors: (*Nickel alloys, Fracture (Mechanics), (*Fracture (Mechanics), Nickel alloys), Fatigue (Mechanics), Propagation, Copper alloys, Iron alloys, Aluminum alloys, Manganese alloys, Test methods, Environmental tests, Corrosion.

Tests were conducted on Monel 400 and Monel K-500 plate bend fatigue specimens. Rapid crack initiation was achieved by means of a mechanical surface notch, and crack growth rates were monitored under constant-total-strain-range full-reverse cycling. Test conditions included a variety of strain range values in both air and simulated slat water environments. It was found that low cycle fatigue crack growth rates can be expressed as an exponential function of applied total strain range. Based on this function a method was devised for comparing the low cycle fatigue crack propagation characteristics of a variety of materials. This method takes into account yield strength level, elastic modulus, and the effects of a corrosive environment. (Author)

AD-613 566 Div. 17, 14, 26
CFSTI Prices: HC$2.00 MF$0.50

Defense Metals Information Center, Columbus, Ohio.
DEFENSE METALS INFORMATION CENTER SELECTED ACCESSIONS MARCH 1965,
comp. by Mary F. Banks. Mar 65, 45p
Contract AF33 615 1121, Proj. 8975

Unclassified report

Descriptors: (*Abstracting, Metallurgy), (*Materials, Bibliographies), (*Metallurgy, Bibliographies), (*Bibliographies, Materials), Alloys, Metals, Nickel alloys, Steel, Stainless steel, Iron alloys, Beryllium, Titanium alloys, Aluminum alloys, Refractory materials, Carbon, Graphite, Ceramic materials, Oxides, Refractory metals, Niobium, Molybdenum alloys, Tantalum, Vanadium alloys, Tungsten alloys, Carbides, Material forming, Mechanical properties, Coatings, Rocket cases, Rocket motor nozzles, Composite materials, Joining.

The 'DMIC Selected Accessions' is a current listing of selected documents and journal articles in an abstracted form on subjects within the technical scope of the Defense Metals Information Center (DMIC). It does not include restricted documents received by DMIC, such as Government classified reports, many of the progress reports issued to Government agencies, or company proprietary reports. It is published to supply current information and to provide an awareness of technical-information sources to Government contractors and subcontractors. Topics include: High-strength alloys, light metals, nonmetallics, refractory metals, coatings, applications, and composites.

AD-613 567 Div. 17, 32
CFSTI Prices: HC$1.00 MF$0.50

Mechanical Properties Data Center, Suttons Bay, Mich.

TENSILE FRACTURE TOUGHNESS.
Mar 65, 7p Inventory rept. no. IR-623
Unclassified report

Descriptors: (*Alloys, Toughness), (*Mechanical properties, Data), Tensile properties, Fracture (Mechanics), Temperature, Aluminum alloys, Steel, Stainless steel, Maraging steels, Tool steel, Iron, Castings, Nickel alloys, Titanium alloys, Vanadium alloys, Molybdenum alloys, Chromium alloys, Manganese alloys, Tin alloys, Data storage systems, Table.

The tabulation presented here is an accounting of the tensile fracture toughness data currently stored in the automated storage file of the Mechanical Properties Data Center. The values here indicate the quantity of results (tested specimens) for each combination of alloy, temperature range and toughness index that are available in response to inquiries for tensile fracture toughness data. In addition to the measured property values, information on test environment, material condition, material form and test procedure are stored to supplement and define the test results. Formulae employed to calculate indices are also stored with data when reported. (Author)

AD-613 644 Div. 17
CFSTI Prices: HC$1.00 MF$0.50

Army Materials Research Agency, Watertown, Mass.
A STUDY OF THE MASS EFFECT AND MICROSEGREGATION IN A HIGH-STRENGTH STEEL CASTING,
by Paul J. Ahearn and Francis C. Quigley. Dec 64, 25p Technical rept. AMRA-TR-64-43
Proj. 1A024401A11001, Task 35215
Unclassified report

Descriptors: (*Steel, Castings), (*Castings, Metallography), (*Metallography, Steel), Mechanical properties, Heat treatment, Tensile properties, Ductility, Crystal growth, Nucleation, Degradation.

The mass effect was studied in a unidirectionally solidified casting by determining mechanical properties vs. distance into the casting. Dendritic variables such as microsegregation and dendritic size, etc., were measured as functions of distance. A cause and effect relationship was established between dendritic variables and mechanical properties. This relationship allowed the formulation of a homogenization treatment that resulted in ductilities of 50 percent reduction of area, at a tensile strength of 240,000 psi. (Author)

AD-613 651 Div. 17
CFSTI Prices: HC$1.00 MF$0.50

Army Materials Research Agency, Watertown, Mass.
DEVELOPMENT OF TOUGH, HIGH-STRENGTH ALPHA-BETA TITANIUM BASE ALLOYS,
by Arthur M. Ayvazian and Robert M. Colton.
Mar 65, 16p Technical rept. no. AMRA-TR-65-03
Proj. 1H024401A111
Unclassified report

Descriptors: (*Titanium alloys, Scientific research), Aluminum alloys, Vanadium alloys, Tin alloys, Copper alloys, Iron alloys, Zirconium alloys, Impurities, Boron, Ductility, Tensile properties, Impact shock, Mechanical properties, Heat treatment, Additives, Toughness.

The addition of varying weight percentages of the substitutional elements Cr, Mo, Mn, Ni, U, and Zr and the interstitial elements O, N, C, and B to the basic alloy, Ti-6Al-6V-2Sn-1/2Fe-1/4Cu, resulted in alloys which exhibited mechanical properties superior to those of the basic alloy. The optimum mechanical properties ranged from 198,000 psi yield strength at 0.1 percent offset, 205,000 psi tensile strength, 5 percent elongation, 14.0 percent reduction of area, and 5.4 ft-lb Charpy V-notch impact energy at -40 F for alloy Ti-6Al-6V-2Sn-1/2Fe-1/4Cu, to 221,000 psi yield strength at 0.1 percent offset, 224,000 psi tensile strength, 11.9 percent elongation, 32.1 percent reduction of area, and 5.9 ft-lb Charpy V-notch impact energy at -40 F for alloy Ti-6Al-6V-2Sn-3/4Cu-3Zr-0.015N-0.114 02-0.00217H-0.12C. (Author)

AD-613 652 Div. 17
CFSTI Prices: HC$0.50 MF$0.50

Rock Island Arsenal, Ill.
CONTROL OF STRESS CORROSION.
Interim rept. no. 2,
by R. H. Wolff. 18 Jan 65, 15p Rept. no. 65-152
Proj. 1CO24401A110
Unclassified report

See also AD-432 320.

Descriptors: (*Steel, Fracture (Mechanics)), (*Stresses, Corrosion), Protective treatments, Maraging steels, Coatings, Abrasive blasting, Tensile properties, Environmental tests, Electroplating, Phosphate coatings, Zinc coatings, Corrosion inhibition.

This study of the control of stress corrosion cracking susceptibility of steels by application of protective coatings was designed to use abrasive blasted specimens to simulate more nearly the surfaces and conditions of a manufacturing operation. Bent beam specimens of 4130, 6150, and 18% nickel maraging steel were prepared at yield strength levels of 204, 231, and 316 ksi respectively for test at 75% of yield strength. Test atmospheres were outdoor, high humidity and salt spray (5%), and cycles of these alternating between salt spray, humidity and air. Cycle tests produced more rapid failure than single environments. Abrasive blasting extended the time to failure as compared to non-blasted uncoated specimens. Coated specimens were electroplated with zinc, zinc phosphatized, or brushed with zinc filled paint. Specimens of 4130 steel had not failed in over a year in outdoor exposure and 6 months in high humidity. Failures were noted with all the materials in cycle tests with indication of extended time to failure as a result of using zinc filled paint. (Author)

AD-613 820 Div. 17, 25

Aerospace Research Labs., Office of Aerospace Research, Wright-Patterson AFB, Ohio.
THE FORMATION AND DISSOLUTION OF CHROMIUM OXIDES IN CHROMIUM,
by Rollin E. Hook and Attwell M. Adair.
Oct 64, 6p ARL-65-29
Unclassified report

Pub. in Metallurgical Society of AIME. Transactions (U. S.) v230 p1278-83 Oct 1964. (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Chromium, Impurities), (*Chromium compounds, Oxides), Microstructure, Heat treatment, Iodides, X-ray diffraction analysis, Recrystallization, High-temperature research, Phase studies, Grain structures (Metallurgy), Grain boundaries.

The response of Cr_2O_3 and Cr_3O_4 to various heat treatments was studied in arc-melted iodide chromium over the temperature range 1000 to 1750C. These oxides, which are present as impurity phases in this material, were identified by X-ray diffraction techniques which were supplemented by optical metallography. As a function of

increasing temperature, Cr_3O_4 is first observable in samples annealed at 1300C and coexists with Cr_2O_3 (the low-temperature oxide) over a temperature range exceeding 200C. As the temperature decreases, Cr_3O_4 dissolves with the concomitant precipitation of Cr_2O_3. Both oxides precipitate predominantly at grain boundaries. The reactions which occur are involved with at least ternary equilibria, possibly due to iron which is present as an impurity in arc-melted iodide chromium. (Author)

AD-613 821 Div. 17, 20

Frankford Arsenal, Philadelphia, Pa. Research and Development Directorate.
FLUX DEPENDENCE OF NEUTRON ENHANCED DIFFUSION IN ALPHA-BRASS,
by R. E. Larsen, G. J. Dienes, and A. C. Damask.
20 Jan 64, 10p Rept. A64-16
Proj. 1C014501B11A Unclassified report
Pub. in Acta Metallurgica (U. S.) v12 p1141-6 Oct 1964
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Brass, Radiation damage), (*Radiation damage, Brass), Neutron flux, Diffusion, Temperature, Heat treatment, Crystal lattice defects, Differential equations.

The flux dependence of neutron enhanced diffusion in alpha-brass was determined by exposing a series of samples to the leakage flux during two different KIWI reactor test runs. The samples were placed at different distances from the reactor shell and were exposed, therefore, to different fluxes of the same energy distribution. The resistivity decrease arising from neutron enhanced short-range ordering was measured and compared with complete resistivity decay curves obtained in the Brookhaven reactor. The characteristic decay times obtained this way are inversely proportional to the diffusion coefficients. The results show that the radiation enhanced diffusion coefficient varies linearly with the neutron flux. This result, in combination with previous studies on the temperature dependence of enhanced diffusion, indicates strongly that the mechanism of defect annealing in alpha-brass during reactor irradiation is that of migration to and disappearance at fixed sinks. (Author)

AD-613 900 Div. 17

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE ELECTRICAL RESISTIVITY OF Mn_3ZnC BETWEEN 4.2 AND 630K,
by M. L. Swanson and S. A. Friedberg.
3 Jul 61, 4p
Grant NSF G12173
Unclassified report
Pub. in Canadian Journal of Physics v39 p1429-32 1961 (Copies available only to DDC users).

Descriptors: (*Manganese alloys, Resistance (Electrical)), (*Magnetism, Manganese alloys), Magnetic properties, Zinc alloys, Carbon alloys, Cryogenics, High-temperature research, Ferromagnetism, Transition temperature, Ferromagnetic materials, Carbides.

The electrical resistivity of an alloy having approximately the composition Mn_3ZnC has been measured between 4.2 and 630K. From a high residual value the resistivity increases with temperature in a complicated way up to 550K, becoming temperature independent above that point. Two anomalous regions are evident corresponding to the magnetic transitions occurring in this substance at approximately 240K and approximately 450K. The general features of the results are interpreted on the basis of a spin-disorder scattering picture. (Author)

18. Military Sciences and Operations

AD-613 594 Div. 18, 32
CFSTI Prices: HC$7.00 MF$2.00

Special Operations Research Office, American Univ., Washington, D. C.
PROCEEDINGS OF THE SYMPOSIUM: THE U. S. ARMY'S LIMITED-WAR MISSION AND SOCIAL SCIENCE RESEARCH, 26, 27, 28 MARCH 1962,
ed. by William A. Lybrand. Jun 62, 388p
Unclassified report

Descriptors: (*Army operations, Symposia), (*Limited war, Counterinsurgency), (*Social sciences, Army operations), Cold war, Army research, Military psychology, Propaganda, Psychological warfare, Sociology, Anthropology, Political science, Foreign policy, History, Economics, Social communication, Deterrence, Military personnel, United States Government, Department of Defense, Communism, Guerrilla warfare.

The three general objectives of the symposium were (1) to present a clear picture of the Army's limited-war mission, with special emphasis on its counterinsurgency mission; (2) to identify the Army's requirements for behavioral and social science research and to stimulate the interest of members of the behavioral and social science community in the Army's research and development programs; and (3) to promote understanding of the Army's research and development efforts and coordination with the efforts of other government agencies and departments which have similar or overlapping (but not duplicate) interests in counterinsurgency problems.

AD-613 608 Div. 18, 32

Michigan State Univ., East Lansing. Coll. of Communication Arts.
ARGUMENTATIVE THEMES IN CIVIL DEFENSE: (1) A CONTENT ANALYSIS OF THE NEW YORK TIMES.
Communication research rept.
by Erwin P. Bettinghaus. 15 Jun 64, 75p
Contract OCD PS64 71
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Civil defense systems, Public opinion), (*Newspapers, Civil defense systems), Nuclear warfare, Shelters, Costs, History, Political science, United States Government, Attitudes, Survival, Disarmament.

The report provides the communication researcher or the public affairs specialist with a category scheme for describing the materials to be found in the civil defense field. It also provides an appendix which attempts to reconcile two divergent reports on civil defense materials. One report, entitled Argumentative Themes in Civil Defense, is compared with Civil Defense and Society by Jeri Nehnevajsa and his colleagues at the University of Pittsburgh. The comparison indicates that the two reports are not incompatible, although the category schemes used in the two seem quite different. The report suggests that there are sixteen general areas into which civil defense materials can be placed. The categories are only relatively independent, but certainly serve to distinguish various positions in the civil defense dialogue. The report also offers the following tentative conclusions regarding the frequency of materials appearing in the New York Times for the period cited: (1) the greatest percentage (39.4%) of all arguments identified referred to fallout shelters; and (2) the largest percentage of all stories (48.2%) were found to be favorable to OCD policies, and, when the neutral articles are removed from consideration, the percentage rises to 69.9%.

AD-613 637 Div. 18
CFSTI Prices: HC$2.00 MF$0.50

Hudson Inst., Harmon-on-Hudson, N. Y.
CHANGING PROSPECTS, MISSIONS AND ROLES FOR CIVIL DEFENSE: 1965-1975,
by William M. Brown, Raymond D. Castil, Herman Kahn, and Anthony J. Wiener. 22 Feb 65, 47p Rept. no. HI-477-RR
Contract OCD OS62 18, Task 4211A
Unclassified report

Descriptors: (*Civil defense systems, Effectiveness), Cold war, Warning systems, Defense systems, Arms control, Deterrence, Strategic warfare, Nuclear warfare, Shelters, USSR, United States.

The major conclusion for civil defense planning is that small or intrawar attacks, arising out of deep crises, are the easiest and cheapest to prepare against, apparently the least unlikely, and yet among the most neglected of civil defense contingencies. While the possibility of massive surprise attack should not be ignored, the relative overemphasis upon it has hampered realistic planning efforts. A more realistic allocation of planning emphases leads to increased interest in civil defense and emergency planning programs containing some or all of the following elements: (1) a crisis mobilization base; (2) a tension mobilization base; (3) a post-attack recuperation base; (4) possible arms control and increased defense agreements, including cooperative civil defense; and (5) programs that vary protection with population density to reduce the lucrativeness of population targets. Strategic and political aspects of such program elements are discussed, and, on balance, they are recommended. (Author)

AD-613 657 Div. 18
CFSTI Prices: HC$3.00 MF$0.75

HRB-Singer, Inc., State College, Pa.
THE DESIGN OF AN INTELLIGENCE DISCIPLINE: ASSESSMENT OF INTELLIGENCE EDUCATIONAL AND TRAINING REQUIREMENTS,
by Jerome K. Clauser and Elton S. Carter.
Mar 65, 56p Rept. no. 352.50-R-3
Contract Nonr381800
Unclassified report

Descriptors: (*Military intelligence, Training), Education, Design.

This study determined the educational and training needs of intelligence personnel. Needs were first identified from interviews, facility visits, a survey of intelligence literature, and first-hand experience; then they were classified according to the knowledge, skills, and attitudes required in the various steps of intelligence production. This report presents these classifications and describes an intelligence discipline that would partially satisfy these needs. (Author)

AD-613 666 Div. 18, 32
CFSTI Prices: HC$5.00 MF$1.00

Pittsburgh Univ., Pa. Dept. of Sociology.
PERCEIVED EFFECTIVENESS OF AMERICA'S DEFENSES,

by Dorothy V. Brodie. Mar 65, 168p
Contract OCD PS64 61; Grant NSF G11309,
Task 48 21C

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Civil defense systems, Public opinion), Effectiveness, Shelters, Nuclear warfare, Cold war, Weapon systems, Population, Sampling, Warning systems, Costs, Sociology, Tables.

The report examines levels of confidence in America's defense system. The specific programs which attempt to satisfy the goals of the system were considered in the analysis. These included the public's estimate of effectiveness of active and passive defenses. Examination of the confidence in passive defenses involved the evaluation of evacuation programs, shelter programs, problems of warning time, local civil defense efforts, cost effectiveness of the system, and evaluation of civil defense programs in relation to various types of weapons effects. All available empirical evidence on these topics, drawn from the University of Pittsburgh's data bank, was reviewed. An attempt was made to specify the topics by pertinent cross-tabulations. Whenever feasible, the sample populations were discretely identified into demographic sub-groups and other pertinent indicators. The data was drawn from various instruments and various samples. Within limitations of the data, a trend analysis establishing the basic chronology of public opinion on the major issues was provided. (Author)

AD-613 667 Div. 18, 23, 26
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
MAINTENANCE SCHEDULING DECISIONS AND THE IMPORTANCE OF INFORMATION,
by W. W. Haythorn. 9 May 61, 26p
Rept. no. P-2302

Unclassified report

Presented at the National Symposium on Human Factors in Electronics, IRE(2nd) May 4 and 5, 1961, Arlington, Va.

Descriptors: (*Maintenance, Weapon systems), (*Weapon systems, Maintenance), (*Management planning, Logistics), Maintenance personnel, Systems engineering, Scheduling, Decision making, Air force personnel, Manpower studies, Reliability, Costs, Effectiveness, Logistics.

The Logistics Systems Laboratory at RAND built a simulated laboratory version of a ballistic missile wing beginning in the spring of 1958 before any ballistic missile squadrons existed in the Air Force. The system was staffed with senior Air Force officers being transitioned from aircraft to missiles. Two important human factors considerations in the study were the role of maintenance management in maintaining missile alert and the requirements for maintenance personnel in accomplishing the scheduled and unscheduled maintenance necessary to assure a high degree of alert. An advanced on-line information system was provided to facilitate management decisions. A procedure for estimating maintenance personnel requirements by Air Force specialty code, using information regarding the reliability of the hardware under a variety of conditions and the possible operational and maintenance policies to be adopted, was developed. These two aspects of the study will be described as will their impact on overall system cost and effectiveness. The application of the information system and the utilization of the maintenance personnel requirements estimation technique were instrumental in increasing missile alert status by approximately 15 per cent and reducing total system cost by like amount. (Author)

AD-613 720 Div. 18, 30
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
MAN-MACHINE SIMULATION PROGRESS,
by M. A. Geisler. 23 Aug 60, 13p
Rept. no. P-2086

Unclassified report

Prepared for presentation to the 1960 International Congress for Logic, Methodology and Philosophy of Science, Stanford Univ., Calif., Aug 24-Sep 2, 1960.

Descriptors: (*Logistics, Decision making), (*Management engineering, Cybernetics), Air Force, Simulation, Costs, Effectiveness, Humans.

The paper discusses a technique which has been largely developed through use in logistics research. The technique has been applied to studies of large logistics management systems in which decision-making under uncertainty is required. The procedure is to build man-machine simulations, and to use them in experimental situations. The output is a description of decision rules, information flows, and an organizational structure that improve the cost and effectiveness of the logistics system. Man is used in these simulations for his learning, adaptiveness, and flexibility. Three such large-scale experiments were conducted in the past three years. The technique is being further developed so as to be practicable with a wider range of problems, by providing more aggregative and less costly simulations. (Author)

19. Navigation

AD-613 477 Div. 19, 1
CFSTI Prices: HC$2.00 MF$0.50

National Aviation Facilities Experimental Center, Atlantic City, N. J. Experimentation Div.
UAL/FAA ATC RADAR BEACON ALTITUDE REPORTING TEST.
Final rept.,
by Felix F. Hierbaum, Jr. and Carlo Yulo. Jan 65, 39p
Proj. 242 006 03X
SRDS RD-65-10

Unclassified report

Descriptors: (*Radar beacons, Height finding), (*Air traffic control system, Radar beacons), Automatic, Data transmission systems, Effectiveness, Tests, Altimeters, Display systems, Transponders, Radar equipment, Airborne, Civil aviation.

The National Aviation Facilities Experimental Center monitored 186 flights of 25 different United Air Lines Boeing 727 aircraft and 17 flights of three different Douglas DC-8F aircraft, all equipped with Air Traffic Control Radar Beacon System (ATCRBS) automatic altitude reporting capability. The participating aircraft were equipped with two different types of automatic altitude reporting configurations, and two different types of ground decoding and display systems were used. Information was gathered on adequacy of the ATCRBS pressure altitude transmission medium, the technical integrity of the two specific decoding and display systems, and correspondence between the pilot altitude display in the cockpit and the radar beacon altitude display at the ground facility. The data analyzed and controller comments on data received are included along with review notes. (Author)

AD-613 556 Div. 19, 6

Burroughs Corp., Paoli, Pa.
BEACON THREE-MODE STUDY.
Final rept., Phase 1.
Sep 64, 124p
Contract FA64WA5116, Proj. 112 026 00C

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is not available for public sale.

Descriptors: (*Radar beacons, Air traffic control systems), (*Air traffic control systems, Radar beacons), Performance (Engineering), Identification systems, Reliability, Transponders, Airborne, Probability, Tests.

20. Nuclear Physics and Nuclear Chemistry

AD-613 190 Div. 20, 13
CFSTI Prices: HC$4.00 MF$1.00

Radiation Research Associates, Inc., Fort Worth, Tex.
PENETRATION OF NEUTRON AND GAMMA RADIATION THROUGH THE OPENINGS OF UNDERGROUND STRUCTURES,
by R. L. French, M. B. Wells, and N. M. Schaeffer.
30 Nov 64, 136p Rept. no. RRA-T41

Unclassified report

Work performed for the Oak Ridge National Laboratory under Subcontract 2267. Funded by the Defense Atomic Support Agency.

Descriptors: (*Underground structures, Radioactivity), (*Radiation measurement systems, Underground structures), Gamma rays, Neutrons, Nuclear particles, Fast neutrons, Thermal neutrons, Shielding, Concrete, Scattering, Fission, Albedo, Dose rate, Dosimeters, Cylindrical bodies, Mathematical models, Graphics, Tables.

Calculations were performed of the radiation intensities in open concrete-lined cylindrical holes and in open concrete bunkers due to a fission source located in air at distances of 100 to 700 feet. The calculations are part of an analysis of experiments performed with the Tower Shielding Reactor II (TSR-II) at Oak Ridge National Laboratory which included numerous radiation measurements in the underground structures with and without shields over the openings. The approach followed in the calculations was to determine, from geometric considerations, the portion of the incident radiation intensities which could enter the structures. Methods were developed to account for effects of the air-ground interface and albedo models were devised to simplify calculation of wall-scattering and production of secondary radiation in the walls. In general the calculated and measured data agree within approximately 25 percent. (Author)

AD-613 194 Div. 20
CFSTI Prices: HC$1.00 MF$0.50

Yale Univ., New Haven, Conn.
COULOMB DISINTEGRATION OF Li6 BY HEAVY NUCLEI. B-4,
by R. L. Gluckstern and G. Breit. 1961, 9p
Contract AF49 638 752
AFOSR 827

Unclassified report

Presented at Conference on Reactions between Complex Nuclei, May 2-4, 1960, Gatlinburg, Tenn. Supported by AEC And AF.

Descriptors: (*Lithium, Radioactive decay), (*Radioactive decay, Lithium), Selection rules, Nuclei, Nuclear reactions, Excitation, Gold, Differential cross sections, Deuterons, Alpha particles.

The present paper is primarily a report on an attempt to ascertain the participation of Coulomb excitation in the observed disintegration of Li6 in its collisions with Au197. The ground state may probably be thought of in some sense as a configuration of a deuteron and an alpha particle in an l = 0 state. This view is supported by the close agreement of the deuteron and Li6 magnetic moments. There seem to be three excited states of spin and parity 3(+), 2(+), 1(+), with primarily d, alpha structure, which play a role in d, alpha scattering. These may be members of an l = 2 triplet, in which case one may expect electric quadrupole transitions to these three levels. The d, alpha model of the four states is not essential, however, for some of the considerations to be presented. Electric dipole transitions between d, alpha configurations are forbidden by the equal charge-to-mass ratios for the deuteron and alpha particle, and quite generally by the parity selection rule. One visualizes the electric disintegration taking place after Coulomb excitation of Li6, to the 3(+) level at 2.184 Mev, for example. This state then decays into an alpha particle and a deuteron, both of which closely follow the original hyperbolic orbit of the Li6, since the energy available in the d, alpha center of mass is 2.18 - 1.47 = 0.71 Mev, which is small compared with the incident lithium energy of 30 to 60 Mev.

AD-613 206 Div. 20, 25

Duke Univ., Durham, N. C.
NUCLEAR SUSCEPTIBILITY OF LIQUID HELIUM-3 UNDER PRESSURE,
by A. Low Thomson, Horst Meyer, and E. Dwight Adams. 8 Jun 62, 6p

Unclassified report

Pub. in Physical Review (U. S.) v128 n2 p509-14 Oct 15 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Nuclear properties, Magnetic properties), (*Helium, Nuclear properties), (*Liquefied gases, Helium), Cryogenics, High-pressure research, Specific heat, Nuclear spins.

New measurements of the nuclear susceptibility of liquid helium-3 between 0.045 and 1.3 K and up to 30.7 atm will be described. At the lowest temperatures, the susceptibility for all pressures has almost reached a constant value. The effective Fermi temperature TF** from these measurements is found to vary from 0.43K at 0.5 atm to about 0.26K at 30.7 atm. From these measurements and recent specific-heat data of several authors, the spin-dependent exchange constant is calculated and is found to decrease with increasing pressure and density. The spin specific heat calculated from susceptibility according to Goldstein's theory is compared to available data. The susceptibility results are compared to recent data of Anderson, Reese, and Wheatley. (Author)

AD-613 207 Div. 20, 25

Duke Univ., Durham, N. C.
NUCLEAR SUSCEPTIBILITY OF SOLID HELIUM-3,
by A. Low Thomson, Horst Meyer, and Prakash N. Dheer. 11 Jul 63, 10p

Unclassified report

Pub. in Physical Review (U. S.) v132 n4 p1455-64 Nov 15 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Nuclear properties, Magnetic properties), (*Helium, Nuclear properties), (*Solidified gases, Helium), Cryogenics, Nuclear spins, Specific heat, Antiferromagnetism.

Measurements of the nuclear susceptibility of solid He3 in the alpha phase between 0.07 and 1.7K are presented. The purity of this helium was better than 99.95%. All the results could be represented by a Curie-Weiss law chi = C/(T + 0) indicating an antiferromagnetic exchange. While theta is smaller than about 0.01K at molar volumes larger than 22 cu cm, it appears to increase systematically when the density increases further. The

magnetic exchange between the nuclei, as deduced from our data, is fairly consistent at molar volumes above 22 cu cm with that obtained from specific heat and relaxation measurements. The higher density data, however, must be regarded as very tentative, in view of their disagreement with other data and theoretical expectations and are not presented in detail. Measurements of the longitudinal relaxation time were also carried out. In particular, for V = 19.5 cu cm/mole, T sub 2 was found to increase approximately as exp (2/T) below 1K, in contradiction with relaxation data of Reich, who found T sub 1 to be constant in this range. New susceptibility data are also presented for a solution of 99.0% He3 1% He4 and a tentative explanation is given to account for the difference with the results on the 'pure' He3. A method for measuring the pressure inside the solid He3 cavity is described. On the basis of these measurements, it is argued that the phase boundary in the V-T plane is unlikely to bend upwards at temperatures below 0.8K, as deduced from Reich's relaxation measurements. (Author)

AD-613 208 Div. 20, 15, 25

Duke Univ., Durham, N. C.
PARTIAL-WAVE ANALYSIS OF THE INELASTIC SCATTERING OF ELECTRONS BY NUCLEI. I. RESULTS FOR QUADRUPOLE EXCITATIONS,
by T. A. Griffy, D. S. Onley, J. T. Reynolds, and L. C. Biedenharn. 1 Jun 62, 8p
Unclassified report

Pub. in Physical Review (U. S.) v128 n2 p833-40 Oct 15 1962 (Copies not available to DDC or Clearinghouse customers)
Supported in part by the ARO(D) and NSF.

Descriptors: (*Nuclear scattering, Electrons), (*Inelastic scattering, Quantum mechanics), (*Nuclear energy levels, Nuclear scattering), Excitation, Quadrupole moments, Differential cross section, Matrix algebra, Numerical methods and procedures, Electrostatic fields.

The problem of nuclear Coulomb excitation by inelastic scattering is approached by using a distorted partial-wave description for the initial and final states of the electron and a multipole expansion of the interaction with the nucleus which is treated in the semiclassical approximation. The method is facilitated by use of a closed analytic form for the contribution to the scattering of partial waves of sufficiently high angular momenta to be insensitive to the shape (but not the charge) of the target nucleus. The contribution of partial waves which do penetrate the nuclear charge distribution is found by numerical evaluation of the various matrix elements using electron wave functions obtained by numerical solution of the radial part of the Dirac equation in a central field. The particular case of electric quadrupole excitation assuming a uniform charge distribution is calculated and compared with the usual Born approximation treatment of inelastic electron scattering. The results of the calculations for 200-MeV electrons differ from the Born approximation result in two ways: for scattering angles less than 90 degrees the Coulomb field causes an apparent; and significant, change in the radius of the charge distribution; for scattering angles greater than 90 degrees the cross section differs qualitatively from the Born approximation result. (Author)

AD-613 209 Div. 20, 25

Duke Univ., Durham, N. C.
PARTIAL-WAVE ANALYSIS OF THE INELASTIC SCATTERING OF ELECTRONS BY NUCLEI. II. APPLICATION TO THE LIQUID DROP MODEL,
by D. S. Onley, T. A. Griffy, and J. T. Reynolds. 1 Oct 62, 2p
Unclassified report

Pub. in Physical Review (U. S.) v129 n4 p1689-90 Feb 15 1963 (Copies not available to DDC or Clearinghouse customers).
Supported in part by ARO (D) and NSF.

Descriptors: (*Nuclear scattering, Electrons), (*Inelastic scattering, Quantum mechanics), (*Nuclear energy levels, Nuclear scattering), (*Nuclear models, Drops), Electrostatic fields, Excitation, Nuclear structure, Nickel, Strontium, Bismuth.

A partial-wave analysis of the solution of the Dirac equation in a Coulomb field is used to calculate inelastic scattering from a nucleus treated as an inhomogeneous charged liquid drop. Using charge density functions obtained from elastic electron scattering, the form factors for quadrupole excitation of the nuclei Ni58,60 and Sr88 are calculated and found to display better agreement with experimental results than the usual Born approximation. To show the expected effects of a large Coulomb field, a similar calculation for Bi209 is also included. (Author)

AD-613 221 Div. 20, 15

Colorado Univ., Boulder.
ANALYSIS OF THE HYPERTRITON IN TERMS OF HARD-CORE POTENTIALS,
by B. W. Downs, D. R. Smith, and T. N. Truong.
22 Oct 62, 9p
Unclassified report

Pub. in Physical Review (U. S.) v129 n6 p2730-8 Mar 15 1963 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR, AEC, and NSF.

Descriptors: (*Tritons, Hyperons), (*Calculus of variations, Nuclear binding energy), (*Nuclear binding energy, Hyperons), Nuclear models, Nucleons, Deuterons, Integrals.

The variation method was used to set upper bounds on the strength of the average lambda-nucleon potential in the hypertriton (lambda H3) required to reproduce the observed binding energy of that system for assumed hard-core radii of 0.2 F, 0.4 F, and 0.6 F. Only two-body lambda-nucleon potentials were considered. Although the well-depth parameter of the required potential increases as the assumed hard-core radius is increased, it seems unlikely that even the largest of the hard-core radii considered here would imply a bound state for the hyperdeuteron (lambda H2). The possibility that the scattering length and the effective range of the required potential may be insensitive to the value of the hard-core radius is discussed. (Author)

AD-613 222 Div. 20, 15

Colorado Univ., Boulder.
AVERAGE LAMBDA-NUCLEON INTERACTION IN THE HYPERTRITON,
by D. R. Smith and B. W. Downs. 27 Aug 63, 5p
Unclassified report

Pub. in Physical Review (U. S.) v133 n2B pB461-5 Jan 27 1964 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF.
See also AD-613 221.

Descriptors: (*Tritons, Hyperons), (*Nuclear binding energy, Hyperons), (*Calculus of variations, Nuclear binding energy), Nucleons, Nuclear models, Deuterons.

Upper bounds on the strength of the average lambda-nucleon interaction required to account for the observed binding of the hypertriton have been established in a variation calculation with a ten-parameter trial function. Central two-body potentials having hard-core radii 0.2, 0.4, and 0.6 F and ranges suggested by consideration of the two-pion-exchange mechanism were used. These calculations led to improvements of 3-6% (depending upon the hard-core radius) in the required strengths over the results of previous calculations with a four-parameter function. The results cannot be used to rule out the existence of a bound hyperdeuteron of spin 0 for a hard-core radius as large as 0.6 F. A partial variation calculation is described, in which only two of the ten parameters of the trial function are varied. When the remaining parameters are fixed by consideration of the two-body subsystems of which the hypertriton is composed, variation of two appropriate parameters leads to required strengths within 3% of the values obtained by varying all ten parameters. (Author)

AD-613 223 Div. 20

Colorado Univ., Boulder.
BINDING ENERGY OF A LAMBDA-PARTICLE IN NUCLEAR MATTER AND THE LAMBDA-NUCLEON INTERACTION,
by B. W. Downs and W. E. Ware. 16 Aug 63, 9p
Unclassified report

Pub. in Physical Review (U. S.) v133 n1B pB133-41 Jan 13 1964 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF.
See also AD-613 222.

Descriptors: (*Hyperons, Nuclear binding energy), (*Nucleons, Hyperons), (*Nuclear binding energy, Hyperons), Nuclear models, Parity.

The binding energy D of a lambda-particle in nuclear matter is calculated with the independent-pair approximation for seven central two-body lambda-nucleon potentials. These potentials are consistent with the binding energy of lambda He5 and therefore represent the spin-averaged lambda-nucleon interaction in S states; they have hard cores of radius 0.4 F or 0.6 F and two-parameter attractive wells with ranges suggested by consideration of the two-pion-exchange mechanism. A simple approximation to the Bethe-Goldstone function is suggested; its use permits D and the partial-wave contributions to D to be evaluated easily. When the S-wave lambda-nucleon potentials are assumed to be appropriate to all angular momentum states, the calculated values of D, corresponding to a nucleon density equal to the central density in heavy nuclei, are consistent with empirical estimates in the range 30-40 MeV for most of the potentials considered. If the correct value of D is close to 30 MeV, some reduction in the strength of the longer ranged potentials may be required in odd-parity states (at least in P states) to bring about agreement; for the shorter ranged potentials considered, no such reduction would be required. If the correct value of D is close to 40 MeV, odd-parity suppression would not be indicated even for the longer ranged potentials. The first three partial-wave contributions to D, as well as D itself, are given for each potential, and the dependence of these on the hard-core radius and on the shape and range of the attractive well is discussed. (Author)

AD-613 239 Div. 20, 26

Washington Univ., Seattle.
METHOD OF CONSTRUCTING THIN-FOIL SPARK CHAMBER PLATES,
by David R. Nygren. 1 Dec 61, 1p
Unclassified report

Pub. in Review of Scientific Instruments (U. S.) v33 n2 p252 Feb 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR and NSF.

Descriptors: (*Foils, Construction), (*Metal plates, Foils), (*Radiation measurement systems, Metal plates), Jigs, Industrial equipment, Force (Mechanics), Processing, Stresses, Plastics.

The increasing utilization in high-energy physics of large spark chambers employing thin-foil plates has created a need for a simple and reliable construction method when the usual procedures are not convenient. The technique described here has been applied with consistent success to aluminum frames (1X1.5 in. stock) measuring 20X56 in., and using 3-mil aluminum foil bonded with epoxy. The frame is placed in a jig which is supplied on all sides with a foil-clamping and tension-inducing lever arrangement. The fingers are spaced 5 in. apart and experience has shown that very uniform tension is easily achieved by releasing the frame after the bond sets. An important feature is that the jig causes the foil tension to be wholly supported by the frame, so that no redistribution of stress occurs when the jig is released. The first foil is applied with about twice the tension necessary for smoothness and rigidity, which results in a noticeable curvature of the longer sides. When bond strength is obtained, the frame is released, trimmed, inverted, and a second foil is applied with one-half the tension supported by the first foil. The effect of this is equal division of the force exerted by the frame against the two foils, and consequently, uniform and equal tension in each. (Author)

AD-613 253 Div. 20

Pennsylvania Univ., Philadelphia.
PHOTONUCLEAR ACTIVATION BY 20.5-MEV GAMMA RAYS,
by W. E. Del Bianco and W. E. Stephens.
12 Dec 61, 9p
Unclassified report

Pub. in Physical Review (U. S.) v126 n2 p709-17 Apr 15 1962 (Copies not available to DDC or Clearinghouse customers)
Supported jointly by AEC, ONR, and NSF.

Descriptors: (*Photonuclear reactions, Gamma rays), (*Nuclear cross sections, Measurement), Crystal counters, Radiation monitors, Photons, Positrons, Carbon, Fluorine.

The photonuclear activation cross section of elements whose (gamma,n) cross sections lead to a suitable positron activity was measured using monochromatic gamma rays from the T3(p,gamma)He4 reaction. The gamma rays were monitored by a 3-in. diam by 4-in. long sodium iodide crystal and calibrated with a 41/2 x 6 in. crystal whose response curve to the gamma rays was determined. The absorption coefficient of these photons in NaI was determined by a good geometry transmission experiment. The positron activity was determined by a coincidence detector, consisting of two 5-in. diam by 2-in. long NaI crystals set on the annihilation radiation photopeaks. This detector was calibrated against a F(18) positron source standardized in a 2 pi flow counter. The C(12) (gamma,n) O(11) and

F(19) (gamma,n) F(18) reactions were investigated over the range from 20.1 to 21.2 Mev. Structure, although reported by other experimenters, was not observed. The (gamma,n) activation cross section was measured at 20.5 Mev for O(16), Cr(50), Fe(54), Cu(63), Zn(64), Mo(92), Sb(121), and Pr(141), giving cross section of 0.60 ± 0.12, 29.1 ± 6.0, 30.0 ± 4.8, 52.5 ± 2.5, 35.7 ± 1.8, 35.4 ± 2.5, 33.4 ± 2.7, 51.7 ± 5.5, respectively. (Author)

AD-613 314 Div. 20
CFSTI Prices: HC$1.00 MF$0.50

Florida State Univ., Tallahassee.
ANGULAR DISTRIBUTION OF GAMMA RADIATION FOLLOWING C12(P1,P2 GAMMA)C12,
by Morikazu Nomoto. 10 Mar 61, 12p
Technical rept. no. TR-2
Contract AF49 638 427
AFOSR 784

Unclassified report

Descriptors: (*Gamma-proton reactions, Carbon), (*Proton bombardment, Gamma-proton reactions), Nitrogen, Nuclear energy levels, Nuclear resonance, Gamma emission, Nuclear spins, Quantum mechanics.

An analysis is made of the angular distributions of the 4.43 Mev gamma radiation following C12(P1, P2 gamma)C12 in the vicinity of the two resonance peaks at bombarding energies 5.36 Mev and 5.89 Mev. It is shown that the angular distributions of such gamma radiation are strongly dominated not only by two resonance levels (3/2+ and 5/2+), in N13, with excitation energies 6.91 Mev and 7.42 Mev (called C and E) respectively, which correspond to the two resonance peaks, but also by another lower level (5/2+) with 6.38 Mev (called A) and their interference. A better fit between the theory and experimental data is obtained for reduced width amplitude ratios of -2.3 and -0.32. Finally, the effects of other neighboring levels in N13 are considered.

AD-613 319 Div. 20
CFSTI Prices: HC$1.00 MF$0.50

Washington Univ., St. Louis, Mo. Dept. of Physics.
DEVICES FOR DETECTING AND TRACING THE PATHS OF IONIZING PARTICLES,
by Arthur L. Hughes. 31 Jan 65, 8p
Grant DA ARO D31 124G427, Projs. 20010501B700, 3816P
AROD 3816:1

Unclassified report

Descriptors: (*Alpha particle detectors, Design), (*Particles trajectories, Alpha particles), Radiation measurement systems.

Since little or no work appears to have been done on spark chambers in which heavily ionizing particles have been studied, experiments were initiated in which tracks were produced by alpha particles. Alpha particles produce roughly 40,000 ion pairs per cm under conditions where the particles usually studied in spark chambers produce only 10 to 30 ion pairs per cm. It was thought that this large difference could be used to throw light on the nature of the processes operating in spark chambers. Sparks following oblique alpha particle tracks making angles up to as much as 60 degrees with the normal to the electrodes have been observed, mixed up with the much more frequently obtained sparks along the normal to the electrodes. Just what conditions controlled the direction of the spark led to an extensive study of methods of applying and shaping the high voltage pulse applied to the spark chamber. (Author)

AD-613 352 Div. 20, 15

Stanford Univ., Calif.
ELECTRON-PROTON BREMSSTRAHLUNG,
by R. A. Berg and C. N. Linder. Dec 60, 42p
Stanford technical note no. TN-32
Contract AF49 638 388, Proj. 9750-37500
AFOSR 97; PB 155 758

Unclassified report

Reference only as AD. Available as PB-155 758, $4.60.

Descriptors: (*Proton scattering, Bremsstrahlung), (*Bremsstrahlung, Proton scattering), (*Electrons, Proton scattering), Perturbation theory, Compton scattering, Pair production, Pions, Meson reactions, Matrix algebra.

In the process in which a single photon is produced in the scattering of an electron from a proton, the dominant part of the cross section is due to photon emission from the electrons. However, if the energy of the process approaches or exceeds the threshold for pi meson production, the proton bremsstrahlung becomes significant. A general form factor analysis is derived as a framework for discussing all proton bremsstrahlung processes. Specifically, the proton electromagnetic process and neutral pion exchange contribution are considered in addition to the pion-induced processes. The latter can be treated conveniently, however, only within the framework of a static approximation. Numerical results are presented. (Author)

AD-613 411 Div. 20, 25

Duke Univ., Durham, N. C.
EFFECT OF 'WEAK MAGNETISM' ON BETA-RADIOACTIVITY,
by Eugene Greuling and Neal Huffaker. 17 Jan 62, 12p

Unclassified report

Pub. in New York Academy of Sciences. Transactions (U. S.) v24 (Ser2) n5 p591-602 Mar 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF and ARO(D).

Descriptors: (*Beta decay, Magnetism), (*Magnetism, Beta decay), Radioactivity, Magnetic moments, Quantum mechanics, Nuclear spins, Pions, Magnetic properties.

The term 'weak magnetism' appearing is explained, and implies that there is some connection between magnetism and beta-radioactivity usually referred to by theorists as 'weak interactions.' An elaboration is presented of computed results valid for the theory of beta-decay of heavy nuclei-nuclei for which it is not a good approximation to ignore either the existence of nuclear charge Ze or the magnitude of the nuclear radius, R.

AD-613 430 Div. 20

High Energy Physics Lab., Stanford Univ., Calif.
MEASUREMENT OF ELECTRON SCATTERING IN CARBON TO COMPARE WITH A MUON EXPERIMENT,
by G. E. Masek, J. P. Toutonghi, R. W. Williams, and D. H. Coward. 15 Jun 61, 6p

Unclassified report

Pub. in Physical Review (U. S.) v124 n2 p555-60 Oct 15 1961 (Copies not available to DDC or Clearinghouse customers)
Supported in part by ONR and NSF.

Descriptors: (*Nuclear scattering, Electrons), (*Electrons, Nuclear scattering), (*Muons, Nuclear scattering), Carbon, Inelastic scattering, Differential cross section, Elastic scattering.

A measurement of the inelastic scattering of high-energy electrons in carbon has been carried out with the express purpose of obtaining an experimental cross section to compare with a recently-completed measurement of muon scattering. A scaling law which connects the electron result with the (higher-energy) muon result is described. Results for the summed (elastic plus all inelastic) cross section at two values of the muon scattering angle are presented. At the smaller angle (momentum transfer =200 Mev/c) agreement with the theoretical (Drell-Schwartz) sum rule is good; at the larger one (=280 Mev/c) it is poorer but within the experimental and theoretical uncertainties. Comparison with the muon results does not alter the previous conclusion: That no muon scattering anomaly is seen. (Author)

AD-613 439 Div. 20

Wisconsin Univ., Madison.
ISOTOPE SHIFT IN THE ARC SPECTRUM OF NICKEL,
by Daniel J. Schroeder and J. E. Mack.
19 Sep 60, 6p
Unclassified report

Pub. in Physical Review (U.S.) v121 n6 p1726-31 Mar 15 1961 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF.

Descriptors: (*Nickel, Isotopes), (*Isotopes, Nuclear spectroscopy), Nuclear shell models, Perturbation theory, Electric fields, Nuclear energy levels, Mass number.

The isotope shift in 31 spectral lines in the nickel arc spectrum has been determined by the use of a Fabry-Perot interferometer. The normal mass shifts were calculated (=+0.0251/cm between Ni58 and Ni64) and substracted from the observed isotope shifts. The differences were attributed to the specific mass and field effects. The relative shifts of levels of four configurations were deduced from the observed line shifts, these being the 'complex' configurations 3d84s2 and 3d84s4p and the two-electron configurations 3d94s and 3d94p. It was shown that the shifts due to the specific mass effect are a significant part of the observed shifts. Perturbations due to interconfigurations interactions were postulated to explain some of the observed shifts. The isotope shift to be expected between Ni58 and Ni64 on the basis of field effect calculations is about -0.021/cm for a single 4s electron, while the shifts observed are as large as +0.1901/cm. A large fraction of this shift must therefore be attributed to the specific mass effect. By noting the deviations of the relative shifts between adjacent pairs of even isotopes from those predicted by mass effect theory it was possible to deduce the relative field effect. Within the experimental error the level shift of the Ni61 relative to the neighboring even isotopes is such that there is no odd-even staggering of the levels. (Author)

AD-613 440 Div. 20

Imperial Coll. of Science and Tech., London (England).
TWO-FIELD COUPLINGS WITH ESPECIAL REFERENCE TO PHOTON-NEUTRAL MESON INTERACTION,
by G. Feldman and P. T. Matthews. 6 May 63, 8p
Unclassified report

Pub. in Physical Review (U.S.) v132 n2 p823-30 Oct 15 1963 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and AFOSR.

Descriptors: (*Photons, Meson reactions), (*Meson reactions, Photons), Nuclear particles, Resonance, Equations, Nuclear spins, Great Britain.

The coupling of two particles of identical quantum numbers, apart from their mass, is considered. It is shown that the effects of direct transitions of one particle into another can be treated exactly in terms of six parameters. These can be taken to be the true masses, the mixing parameters, and the partially renormalized coupling constants. This is a generalization of conventional mass renormalization for a single field. The special case of a photon and a neutral vector meson is discussed. Resonance effects may occur if the photon is virtual. However, gauge invariance and the vanishing of the photon mass forbid such effects for real photons, unless a dynamical accident relates the bare photon mass to the effective photon-meson couplings in a particular way. (Author)

AD-613 468 Div. 20, 14
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
DYNAMIC PROGRAMMING AND AN INVERSE PROBLEM IN NEUTRON TRANSPORT THEORY,
by R. E. Bellman, H. H. Kagiwada, and R. E. Kalaba. Mar 65, 23p Rept. no. RM-4495-PR
Contract AF49 638 700
Unclassified report

Descriptors: (*Neutron transport theory, Dynamic programming), Nuclear particles, Boundary value problems, Invariance, Differential equations, Neutron absorption, Algebra.

The neutron theory of transport processes generally is devoted to problems of determining properties of radiation fields, given certain sources and transporting media. Nevertheless, it has long been recognized that inverse problems, in which we measure some aspects of the radiation field and wish to deduce properties of the sources and the media, are of great significance in the areas of neutron transport, radiative transfer in planetary atmospheres, and astrophysics, among others. The report presents an approach along the line of dynamic programming to the neutron theory of transport processes.

AD-613 472 Div. 20, 15
CFSTI Prices: HC$4.00 MF$1.00

Illinois Univ., Urbana. Dept. of Physics.
SURVEY OF SOME SYSTEMATIC PROPERTIES OF THE NUCLEAR ELECTRIC DIPOLE TRANSITION PROBABILITY,
by Charles-Fs. Perdrisat. 1965, 126p
Contract AF49 638 1048
Unclassified report

Descriptors: (*Selection roles, Probability), (*Nuclear energy levels, Selection rules), Nuclear properties, Nuclear shell models, Parity, Internal conversion.

The single-particle estimate for the electromagnetic transition probabilities is summarized. A classification of the electric dipole transitions with measured rates is proposed, as a function of the kind of nucleus and levels involved. The spread of the reduced transition probabilities within a number of classes is small. A detailed discussion of the experimental data and of the relevant nuclear models is given.

AD-613 480 Div. 20
CFSTI Prices: HC$4.00 MF$0.75

General Dynamics/Fort Worth, Tex.
ANALYSIS OF RADIATION STREAMING THROUGH SINGLE-BEND DUCTS.
Rept. for 1 Oct 63-30 Sep 64,
by J. D. Marshall. Jan 65, 106p
Contract AF29 601 6213, Proj. 6773, Task 677301
WL TR-64-136
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Neutron transport theory, Monte Carlo method), (*Monte Carlo method, Neutron transport theory), (*Shielding, Radioactivity), Gamma rays, Duct bends, Penetration.

An experimental study has been performed to obtain data for verification of the Monte Carlo Multibend-Duct Procedure and to obtain data for a parametric study of radiation transported through a ducted shield. To accomplish these objectives, a 14-Mev neutron source and Co60 gamma-ray sources have been used in conjunction with single-bend aluminum ducts in water shields. The duct bends were varied from 30 to 60 degrees and the top-leg-to-bottom-leg ratio from 0.3 to 3.0. The calculation procedure has been verified within certain limitations, which were mainly a function of shield thickness. Experimental results were integrated over the exit plane of the ducted shields. The scattered component of the dose rate was obtained by subtraction of the calculated direct-beam component from the integrated experimental dose rates. The scattered component was 70 to 90 percent of the total radiation dose and increased with increasing shield thickness. No other general tendencies were noted over the range of the parameters considered. (Author)

AD-613 491 Div. 20, 15

Duke Univ., Durham, N. C.
ON THE DERIVATION OF ASYMPTOTIC EXPANSIONS OF EXPONENTIAL INTEGRALS, WITH APPLICATIONS TO COULOMB EXCITATION FUNCTIONS,
by Von P. J. Brussaard, T. A. Griffy, and L. C. Biedenharn. 2 Apr 62, 13p
Unclassified report

Pub. in Annalen der Physik (East Germany) ser7 v10 n1/2 1962 (Copies available only to DDC users)
Supported in part by ARO(D), NSF, and Research.

Descriptors: (*Nuclear scattering, Integrals), (*Integrals, Power series), Excitation, Electric fields, Perturbation theory, Differential equations, Probability, Gamma emission, Special functions (Mathematical).

The Coulomb integrals and the Coulomb excitation functions are examined as the parameter 2pi(Zsub 1)(Zsub 2) e squared (1/v - 1/u)/h becomes very large. This region is of importance for thick target experiments, heavy ions and low velocities. It is shown that asymptotic expansions of the Coulomb integrals can be expressed with the use of four functions related to the Airy integral. A method of finding the angular distributions of de-xitation gamma rays is given.

AD-613 492 Div. 20, 25

Duke Univ., Durham, N. C.
SOME REMARKS ON THE FEYNMAN, GELL-MANN FORMULATION OF THE FERMI INTERACTION,
by L. C. Biedenharn. 23 Oct 61, 2p
Unclassified report

Pub. in Nuovo Cimento (Italy) v22 (Ser10) p1097-8 Dec 1 1961 (Copies available only to DDC users).
Supported by ARO(D) and NSF.

Descriptors: (*Beta decay, Electrostatic Fields), (*Field theory, Beta decay), Relativity theory, Quantum mechanics, Parity, Operators (Mathematics), Iterative methods, Perturbation theory.

Some of the consequences of the Feynman, Gell-mann proposal are explored, for the experimentally important case of beta decay in the presence of an exteral Coulomb Field.

AD-613 493 Div. 20

Duke Univ., Durham, N. C.
A NOTE ON THE ANGULAR DISTRIBUTION OF INELASTICALLY SCATTERED PARTICLES IN COULOMB EXCITATION,
by T. A. Griffy and L. C. Biedenharn. 13 Feb 62, 5p
Unclassified report

Pub. in Nuclear Physics (Netherlands) v36 p452-6 1962 (Copies available only to DDC users)
Supported in part by ARO(D) and NSF.

Descriptors: (*Nuclear particles, Excitation), (*Inelastic scattering, Nuclear particles), Distribution, Quantum mechanics, Differential equations, Polynomials.

The angular distribution of the inelastically scattered particles following Coulomb excitation is calculated for electric quadrupole transitions. The quantum mechanical calculations are performed for the case of finite energy loss and a comparison is made between the semi-classical and quantum mechanical angular distributions. (Author)

AD-613 505 Div. 20

Stevens Inst. of Tech., Hoboken, N. J.
MEAN LIFE-TIME OF THE NEUTRAL PION,
by E. L. Koller, S. Taylor, and T. Huetter. 11 Oct 62, 5p
Unclassified report

Supported in part by NSF, ONR and American Academy of Arts and Sciences.
Pub. in Nuovo Cimento (Italy).
Series X v27 p1405-9 Mar 16 1963.
Copies available only to DDC users.

Descriptors: (*Pion, Half life), Mesons, Radioactive decay, Measurement, Bevatrons, Nuclear physics.

The mean life-time of the pi(o) meson is measured by the method of Harris, Orear and Taylor. The decay distance of pi(o)-mesons produced by K sub pi 2-decay at rest (K(+)yields pi (+) + pi(0) and subsequent decay by the Dalitz mode (pi(0) yields e(+) + e(-)+ gamma) is measured. Using Ilford G-5 emulsions, exposed in the 300 MeV/c separated K(+) beam from the Bevatron at Berkeley, 88 of the above events were found. The observed mean pi(0) life-time is (2.8±0.9).10/16S. (Author)

AD-613 506 Div. 20

Duke Univ., Durham, N. C.
NUCLEAR RESONANCE EFFECTS IN COULOMB

EXCITATION,
by T. A. Griffy and L. C. Biedenharn. 29 Sep 61, 12p

Unclassified report

Pub. in Nuclear Physics (Netherlands) v32 p273-85 1962 (Copies available only to DDC users)
Supported in part by AEC, NSF, Research Corp., and ARO(D).

Descriptors: (*Nuclear resonance, Excitation), Elastic scattering, Inelastic scattering, Quantum mechanics, Hamiltonian, Differential equations, Integrals, Sodium.

The changes in the Coulomb excitation process due to nuclear interactions in the incident and exit channels are calculated. It is shown that resonances in the elastic scattering channel interfere coherently with the Coulomb excitation process and thus lead to anomalies in the cross section for Coulomb excitation. The predictions of this work are compared with the results of Temmer and Heydenburg for the reaction Na(23) (p, p' gamma). (Author)

AD-613 509 Div. 20

Syracuse Univ., N. Y. Dept. of Physics.
A COMMENT ON THE SIGMA-LAMBDA PARITY AND RESOLUTION BETWEEN THE BOUND STATE MODEL AND THE ISOBAR MODEL OF Y*,
by S. Iwao. 2 Feb 62, 3p

Unclassified report

Pub. in Nuovo Cimento (Italy). Series X v23 p784-6 Feb 16 1962 (Copies available only to DDC users).
Supported in part by NSF and AFOSR.
See also AD-613 510.

Descriptors: (*Resonance scattering, Nuclear models), (*Hyperons, Parity), (*Parity, Hyperons), Nuclear isobars, Nuclear binding energy, Inelastic scattering, Pions, Sigma hyperons, Proton scattering.

AD-613 510 Div. 20, 15

Syracuse Univ., N. Y. Dept. of Physics.
PRELIMINARY DETERMINATION OF SIGMA-LAMBDA PARITY USING POLOLOGY,
by S. Iwao. 18 Oct 61, 10p

Unclassified report

Supported in part by NSF and AFOSR.
Pub. in Nuovo Cimento (Italy) Series X v23 p516-25 Feb 1 1962.
Copies available only to DDC users.
See also AD-613 509.

Descriptors: (*Hyperons, Parity), (*Parity, Hyperons), Strange particles, K mesons, Pions, Baryons, Protons, Antiparticles, S-matrix, Differential cross section, Polynomials, Matrix algebra, Sigma hyperons.

A convenient expression for the normalization of the T-matrix pole term is given. The method of pololgy is applied to various processes. The coupling constant of the N lambda K interaction is determined from the anti-proton + p lambda + anti lambda angular distribution. Further application of the method to sigma(0)-K(0) production from pion-proton interactions and sigma hyperon-pion production from K(-)+p interactions indicate that the sigma-lambda relative parity is even, although this conclusion cannot be considered firm. This constitutes support for the hypothesis of global symmetry. Some additional applications of pololgy are suggested and discussed. (Author)

AD-613 546 Div. 20
CFSTI Prices: HC$3.00 MF$0.75

Pennsylvania Univ., Philadelphia.
RESEARCH IN GAMMA-RAY SCATTERING, ABSORPTION, AND ELECTRON POLARIZATION.
Final rept.
Jul 62, 66p
Contract AF49 638 537
AFOSR 3147

Unclassified report

Continuation of Contract AF18 600 894.

Descriptors: (*Gamma rays, Scientific research), Gamma-ray scattering, Absorption, Elections, Polarization, Ground state, X-ray tubs, Rubidium, Vapors, Electron beams, Electron tubes, Reports.

AD-613 582 Div. 20, 15
CFSTI Prices: HC$7.00 MF$1.75

California Univ., La Jolla.
ANNIHILATION OF POSITRONS IN METALS.
Doctoral thesis,
by Chanchal Kumar Majumdar. 5 Feb 65, 307p
Technical rept. no. TR-29
Contract Nonr221611, Proj. NR017 630

Unclassified report

Descriptors: (*Positrons, Annihilation reactions), (*Annihilation reactions, Metals), Positronium, Electrons, Correlation techniques, Perturbation theory, Temperature, Fermions.

The theory of positron annihilation in metals, including electron-positron and electron-electron interaction, is discussed. It is well-known that the Coulomb force of the positron causes very major changes in the motion of the electrons. It is established that a sharp 'break' in the angular correlation curve of the two gamma-rays resulting from singlet state annihilation occurs at precisely those angles where it should be expected in the absence of electron-positron interaction. This makes positron annihilation in metals a useful tool for the investigation of the true Fermi surface. Taking advantage of such a break in the angular correlation curve, a simple experiment is proposed to measure the effective mass of the positron in metals. The experiment consists in a study of the temperature dependence of the angular correlation curve. It is found that an electron-positron bound state or a positronium-like state does not exist in metals. A more general result is derived: in a non-interacting electron gas in the presence of a localised external potential, there is no sharp distinction between bound and unbound states. (Author)

AD-613 591 Div. 20, 14, 17
CFSTI Prices: HC$2.00 MF$0.50

Radiation Effects Information Center, Columbus, Ohio.
RADIATION EFFECTS INFORMATION CENTER MONTHLY ACCESSION LIST. ABSTRACT NO. 22630 TO 26689, PART I.
Rept. for 1-31 Mar 65.
10 Apr 65, 26p
REIC Accession list no. 85
Contract AF33 615 1124

Unclassified report

Continuation of Contract AF33 657 10085.

Descriptors: (*Materials, Radiation damage), (*Radiation damage, Abstracting), (*Bibliographies, Radiation damage), Metals, Ceramic materials, Organic materials,

Polymers, Electronic equipment, Space environmental conditions.

Contents: March 1, 1965 to March 31, 1965; Metallic materials; Ceramic materials; Organic materials; Polymeric materials; Inorganic materials; Electronic materials, components, and devices; Space environment and effects on materials; Experimental devices and techniques: Miscellaneous.

AD-613 595 Div. 20, 15
CFSTI Prices: HC$1.00 MF$0.50

Queen's Univ., Belfast (Northern Ireland).
ASYMPTOTIC FORM OF THE ELECTRON CAPTURE CROSS SECTION IN THE CLASSICAL APPROXIMATION,
by D. R. Bates and R. A. Mapleton. 1964, 6p
Contract N62558 3634
Unclassified report

Descriptors: (*Electron capture, Nuclear cross sections), (*Nuclear cross sections, Electron capture), Differential cross section, Proton scattering, Mechanics, Probability.

It has been shown that if the protons are regarded as distinguishable particles the asymptotic form of the cross section for H(+) + H(1s) to H(1s) + H(+) in the (non-relativistic) First Born and distorted wave approximations is Q(1s-1s) = 2Mpi(a-squared) /3m (E-cubed), where E is the energy of the incident proton in atomic units, M is its mass and m is the mass of the electron. A simple classical treatment of this problem is given.

AD-613 616 Div. 20
CFSTI Prices: HC$4.00 MF$0.75

Nevis Labs., Columbia Univ., Irvington-on-Hudson, N. Y.
MUON CAPTURE IN (p-mu-d) (+) MOLECULES,
by I-Tung Wang. 1964, 105p NEVIS-128
Unclassified report

Descriptors: (*Muons, Proton reactions), (*Proton reactions, Muons), Deuteron reactions, Neutrinos, Helium, Hyperfine structure, Nuclear spins, Neutron spectrum, Neutron counters, Scintillation counters.

The (p-mu-d) (+) molecules and mu-He3 atoms formed in liquid hydrogen were used to detect neutrons from muon capture by deuteron and from muon capture by He3. A purified muon beam was stopped in a target containing ultrapure liquid hydrogen with 0.32% deuterium added. The time distribution of neutrons from rare muon capture processes was measured. Converted to the muon-d atom case, the measured capture rate gives 388 ± 101 1/sec for muon capture from the doublet state of muon-d, compared with the theoretical rate of 348 1/sec predicted by the current phenomenological muon capture theory; and it provides the clearest verification of the Pauli exclusion principle effect in muon capture. The neutron rate from muon capture by He3 was shown to be in good agreement with theory. A theoretical investigation of the muon-d capture and muon-He3 capture into 'break-up' channels was carried out. Neutron energy spectra for muon capture in the separate muon-d hyperfine states were obtained. The muon-He3 capture processes were studied in the plane-wave approximation, with Gaussian-type wave function for the He3 nucleus.

AD-613 700 Div. 20

Stockholm Univ. (Sweden).
K(-) -ABSORPTION IN NUCLEI AND THE SIGMA HYPERON PION RESONANCE Y(0)*,
by A. Frisk. 1964, 12p
Grant AF EOAR62 15
AFOSR 3130
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*K mesons, Meson capture), (*Nuclear resonance, Sigma hyperons), (*Sigma hyperons, Pions), Nuclear energy levels, Nuclear binding energy.

The total energy distribution and the distribution of the invariant quantity M from 106 two prong stars are plotted with a charged sigma hyperon and a pion due to absorptions of negative K-mesons at rest in emulsion nuclei. It should be emphasized that the stars contain no other prongs than those due to the hyperon and the pion. The two distributions have about the same width and it is difficult to conclude anything about Y(0)* production on this basis.

AD-613 702 Div. 20, 8, 14, 25
CFSTI Prices: HC$3.00 MF$0.75

General Atomic Div., General Dynamics Corp., San Diego, Calif.
TRANSIENT AND DISPLACEMENT EFFECTS TESTS WITH AN ACCELERATOR PULSED FAST ASSEMBLY.
Rept. for 11 Sep-31 Dec 64,
by V. A. J. van Lint and J. W. Harrity. Mar 65, 60p
GA-6008, GAP-460
Contract AF29 601 6662, Proj. 5710, Task 16 015
WL TR-65-2
Unclassified report

Descriptors: (*Neutron beams, Test facilities), (*Transistors, Radiation damage), (*Capacitors, Radiation damage), (*Radiation damage, Electronic equipment), Fast reactors, Linear accelerators, Semiconductors, Silicon, Crystal lattice defects, Electrical insulation, Polyester plastics, Photoconductivity, Transients.

Displacement and ionization radiation effects tests were performed with an Accelerator Pulsed Fast Assembly and compared with linear accelerator and TRIGA pulsed reactor tests. Specific measurements were made on the annealing of beta degradation in npn and pnp silicon transistors and on the conductivity induced by a short neutron-gamma pulse in a 0.5 micro-F Mylar capacitor. The results indicate no measurable annealing of the damage in npn transistors, but a significant (factor of about 2) annealing with a decay time of about 100 micro-sec in pnp transistors. The conductivity induced in the Mylar capacitor could be attributed predominantly to the gamma component and exhibited no unusual behavior due to the short neutron pulse. (Author)

AD-613 723 Div. 20

Stanford Univ., Calif.
INELASTIC NEUTRON SCATTERING NEAR THRESHOLD,
by A. B. Tucker, J. T. Wells, and W. E. Meyerhof.
1964, 3p
AROD 3269:5
Unclassified report

Pub. in mono Congres International de Physique Nuclearie, Paris, Jul 64. Comptes Rendus, 1964, v. 2, p. 671-2.
Copies available only to DDC users.

Descriptors: (*Inelastic scattering, Neutron scattering), (*Neutron scattering, Inelastic scattering), Nuclear energy levels, Neutron cross sections, Nuclear spectroscopy.

The cross section for inelastic neutron scattering is determined to the first excited states, as well as a few higher ones, of Fe56, Cu63, Zr90, Ba138, and Ce140. Inelastic neutron scattering provides information about the fluctuations in width and spacing of the compound-nucleus levels. Once these effects are understood, inelastic neutron scattering becomes a useful tool in nuclear spectroscopy, permitting spin and parity determination of nuclear levels. A need is shown for width-fluctuation corrections to the Hauser-Feshback theory.

AD-613 742 Div. 20, 15

McMaster Univ., Hamilton (Ontario).
SOME LOW-ENERGY ATOMIC STOPPING CROSS SECTIONS,
by J. H. Ormrod, J. R. MacDonald, and H. E. Duckworth. 9 Nov 64, 10p
Grant AF AFOSR159 63
AFOSR 65 0482

Unclassified report

Pub. in Canadian Journal of Physics v43 p275-84 Feb 1965.
Copies available only to DDC users.

Descriptors: (*Particle beams, Inelastic scattering), (*Inelastic scattering, Particle scattering), Probability, Absorption, Proton bombardment, Proton capture, Aluminum, Carbon, Neon, Monte Carlo method, Proton cross sections.

The electronic stopping cross sections for protons in aluminum are reported in the energy interval $10 < E < 70$keV. Stopping cross sections below 150 keV in carbon targets for projectiles with $13 < Z < 19$, and in aluminum targets for $Z < 11$ are reported also. The results are compared with theory and show reasonable agreement. The previously reported periodic dependence of inelastic collisions in the stopping medium on the atomic number of the projectile is also evident in the present results. (Author)

AD-613 754 Div. 20

Stockholm Univ. (Sweden).
INTERACTION OF 2 GeV NEGATIVE PI-MESONS WITH EMULSION NUCLEI,
by B. E. Ronne and O. Danielsson. 1962, 19p
Grant AF EOAR62 15
AFOSR 3129

Unclassified report

Pub. in Arkiv för Fysik (Sweden) v22 n10 p175-91 1962 (Copies available only to DDC users).

Descriptors: (*Meson reactions, Nuclei), (*Pions, Nuclear reactions), (*Nuclear reactions, Pions), Nucleons, Meson cross section, Antiprotons, Particle beams, Particle trajectories, Ionization, Energy, Strange particles, Radiation measurement systems, Nuclear physics.

An investigation of 281 interactions of 2 GeV/c negative pions with emulsion nuclei is reported. The fraction of stars with charged secondary pions is 75±3 per cent, and the mean number per star of emitted charged pions is 1.21 ±0.08. Only 2 K-mesons have been observed, which confirms other results that the production cross section of strange particles is low. Our results have been compared with the predictions from a cascade calculation by Metropolis et al. which starts from the known elementary pion-nucleon and nucleon-nucleon cross sections. The agreement between the calculated data and our experimental results is good as far as the multiplicity, energy spectrum and angular distribution of emitted pions and also the energy spectrum of knock-on protons are concerned. (Author)

AD-613 776 Div. 20, 2

New York Univ., N. Y.
ELECTROMAGNETIC PROPERTIES OF THE NEUTRINO,
by Jeremy Bernstein, Malvin Ruderman, and Gerald Feinberg. 11 Jun 63, 7p
Grants DA ARO D31 124G356, NSF G20964
TID 20711

Unclassified report

Pub. in Physical Review (U. S.) v132 n3 p1227-33 Nov 1 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Neutrinos, Electromagnetic properties), Astrophysics, Experimental data, Nuclear physics.

A detailed survey of the experimental information on the neutrino charge, charge radius, and magnetic moment is made. Both weak-interaction data and astrophysical results can be used to give precise limits to these quantities, independent of the supposition that the weak interactions are charge conserving. (Author)

AD-613 798 Div. 20, 2, 25

North Carolina Univ., Chapel Hill.
A NEW TECHNIQUE FOR RECORDING HEAVY PRIMARY COSMIC RADIATION AND NUCLEAR PROCESSES IN SILVER CHLORIDE SINGLE CRYSTALS,
by Lawrence Slifkin and Charles B. Childs. 1961, 2p
Contract AF49 638 865
AFOSR 3364

Unclassified report

Pub. in I E E E Transactions on Nuclear Science (U. S.) v NS9 n3 p413-4 Jun 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Cosmic rays, Radiation measurement systems), (*Radiation measurement systems, Cosmic rays), (*Nuclear reactions, Radiation measurment systems), (*Silver compounds, Chlorides), (*Single crystals, Silver compounds), Crystal lattice defects, Nuclear scattering, Photoelectric effect, Photoconductivity.

A new technique for recording heavy primary cosmic radiation and nuclear processes has been developed through decoration of dislocations formed by these processes in large silver chloride single crystals. The crystals are prepared and exposed to cosmic radiation during high altitude balloon flights. The crystals are then treated according to the Haynes-Shockley photoelectric technique which results in silver collecting at the dislocations and thereby decorates the dislocations at room temperature within two hours. Since silver chloride is transparent to visible light, the decorated dislocations are observable with an optical microscope at a magnification of about 150-200. A one-to-one correspondence has been established between tracks in the crystals and those in photographic emulsions accompanying the crystals during balloon flights. Examples of heavy primary cosmic radiation and nuclear processes in crystals are shown. (Author)

AD-613 802 Div. 20, 25

Purdue Univ., Lafayette, Ind.
ELECTROPRODUCTION OF NEUTRAL PIONS FROM DEUTERIUM,
by Stephen L. Brown. 12 Mar 63, 4p
Grant AF AFOSR2761 63
AFOSR 65-0485

Unclassified report

Pub. in Physical Review (U. S.) v131 n3 p1330-3 Aug 1 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Deuterium, Electron bombardment), (*Pions, Deuteron reactions), Nuclear cross sections, Vector analysis, Operators (Mathematics).

Making use of the impulse approximation and the one-nucleon dispersion theoretical amplitudes, a theoretical expression for the differential cross section of the process e+d yields e+d+neutral pion has been calculated. An experiment which would be useful in the investigation of the nucleon form factors is proposed. At energies near the (3,3) resonance, the cross sections reach values up to 10 to the -35 power sq. cm/MeV sr. sq. depending on the electronic four-momentum transfer. (Author)

AD-613 813 Div. 20, 15

Purdue Univ., Lafayette, Ind.
UNITARY SYMMETRY AND THE TRANSFORMATION eta to neutral pi meson,
by S. P. Rosen. 26 Jun 63, 6p
Grant AF AFOSR276 63
AFOSR 65-0487

Unclassified report

Pub. in Physical Review (U. S.) v132 n3 p1234-9 Nov 1 1963 (Copies not available to DDC or Clearinghouse customers). See also AD-613 814.

Descriptors: (*Pions, Decay schemes), (*Meson reactions, Pions), Baryons, Nuclear spins, Groups (Mathematics), Transformations (Mathematics), Selection rules.

The transformation eta to neutral pimeson, which is thought to play a dominant role in the decay mode eta to pi(+)pi(-)pi(0), is examined in the light of unitary symmetry and several different models for eta decay. Beside the models of Gell-Mann, Sharp, and Wagner (GSW), and of Barrett and Barton (BB), these include the strong coupling of pseudoscalar and vector meson octets with the unitary singlet vector meson phi, and the electromagnetic coupling of pseudoscalar and vector mesons. Group-theoretical methods are used to confirm that the contributions of all but one of the lowest order diagrams on the GSW model cancel one another. The same methods show that the cancellations in lowest order are not as serious for the BB model, and are nonexistent for models involving the phi meson. (Author)

AD-613 814 Div. 20, 15

Purdue Univ., Lafayette, Ind.
UNITARY SYMMETRY AND WEAK INTERACTIONS,
by S. P. Rosen. 13 Feb 64, 4p
Grant AF AFOSR276 63
AFOSR 65-0483

Unclassified report

Pub. in Physical Review Letters (U. S.) v12 n4 pC535 1-4-4 Apr 6 1964 (Copies not available to DDC or Clearinghouse customers).
See also AD-613 813.

Descriptors: (*Mesons, Decay schemes), (*Decay schemes, Mesons), Hyperons, Leptons, Pions, Parity, Nuclear spins, Hamiltonian, Transformations (Mathematics).

It is shown that, within the framework of unitary symmetry, it is possible to derive observed relations between the asymmetry parameters for the nonleptonic modes of hyperon decay. Also derived are two symmetry principles and time-reversal invariance.

AD-613 815 Div. 20, 15, 25

Purdue Univ., Lafayette, Ind.
SOME PROPERTIES OF TRIANGULAR REPRESENTATIONS OF SU(3),
by S. P. Rosen. 26 Sep 63, 5p
Grant AF AFOSR276 63
AFOSR 65-0484

Unclassified report

Pub. in Journal of Mathematical Physics (U. S.) v5 n2 p289-93 Feb 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Nuclear models, Matrix algebra), (*Matrix algebra, Nuclear models), Tensor analysis, Groups (Mathematics), Operators (Mathematics), Nuclear magnetic moments, Quantum mechanics, Nuclear spins.

The occurrence of an equal-spacing mass rule in the unitary decuplet can be explained either by observing that the isotopic spin and hypercharge of each particle are related by T = 1 + 1/2Y, or by making use of a theorem due to Diu and Ginibre. This theorem states that, in all triangular representations of SU(3), the matrix elements of an arbitrary tensor operator depend upon one reduced matrix element instead of two. Here we present a new proof of the Diu-Ginibre theorem and use it show that relations of the form T = V ± 1/2Y exist for all triangular representations. We also show that the L and K spins are related to their corresponding hypercharges by L = V ± 1/2Y sub L and K = V ± 1/2Y sub K. One consequence is that the masses and magnetic moments of particles in a triangular multiplet are equally spaced. Other consequences are also discussed. (Author)

AD-613 816 Div. 20, 15, 25

Colorado Univ., Boulder.
CONNECTION BETWEEN THE RELATIVISTIC AND NONRELATIVISTIC FORM OF THE NUCLEON-NUCLEON AMPLITUDE,
by A. O. Barut and M. Samiullah. 8 May 64, 5p
Grant AF AFOSR30 63, Proj. 9751, Task 975103
AFOSR 65-0474

Unclassified report

Pub. in Physical Review (U. S.) v135 n6B pB1356-8 Sep 21 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Nuclear scattering, Nucleons), (*Relativity theory, Nuclear scattering), Intensity, Polarization, Nuclear spins, Transformations (Mathematics), Tensor analysis.

The connection between the nonrelativistic (Wolfenstein-Ashkin) and the relativistic (Goldberger-Grisard-

MacDonald-Wong) amplitudes of the nucleon-nucleon scattering is obtained using a two-component form of the latter. This connection involves simple functions of E and cos theta. It is then possible to translate the analysis of scattering and polarization experiments in terms of one set of amplitudes into the other. (Author)

AD-613 817 Div. 20, 15

Colorado Univ., Boulder.
ON THE COUPLING CONSTANTS OF MASSLESS PARTICLES,
by A. O. Barut. 9 May 64, 4p
Grant AF AFOSR30 63, Proj. 9751, Task 9751 03
AFOSR 65-0473

Unclassified report

Pub. in Physics Letters (U. S.) v10 n3 p356-7 Jun 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Elementary particles, Relativity theory), (*Electromagnetic properties, Elementary particles), Photons, Neutrinos, Leptons, Intensity, Polarization, Groups (Mathematics), Nuclear spins.

The restrictions imposed on the most general form of the form factors for massless particle coupling, which in the limit go over to the coupling constants, are given and the universality of the form factors is shown. Only invariance under the proper inhomogeneous Lorentz group is used.

AD-613 818 Div. 20

Colorado Univ., Boulder.
SECONDARY DIFFRACTION PEAKS IN PION-NEUTRON AND KAON-NEUTRON SCATTERINGS,
by A. O. Barut and W. S. Au. 20 Aug 64, 5p
Grant AF AFOSR30 63, Proj. 9751, Task 9751 03
AFOSR 65-0477

Unclassified report

Pub. in Physical Review Letters (U. S.) v13 n15 p489-91 Oct 12 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Neutron scattering, Diffraction), Nuclear spins, Nuclear magnetic resonance, Neutron cross sections, K mesons, Pions.

The secondary peaks observed in pi neutron and K neutron scatterings can be explained well, even with the use of a very small spin-flip amplitude. By the use of more than one partial wave, even the wiggly structure on the secondary peaks can be explained. (Author)

AD-613 823 Div. 20

Carnegie Inst. of Tech., Pittsburgh, Pa.
EXCITED STATES OF IODINE-127.
Revised ed.,
by S. Jha and R. Leonard. 14 Aug 64, 6p
Grant AF AFOSR278 63
AFOSR 65-0489

Unclassified report

Pub. in Physical Review (U. S.) v136 n6B pB1585-90 Dec 21 1964 (Copies not available to DDC or Clearinghouse customers).
Revision of rept. dated 2 Mar 64.

Descriptors: (*Iodine, Nuclear energy levels), Life expectancy, Isotopes, Xenon, Tellurium, Gamma rays, Anisotropy, Nuclear spins, Magnetic moments, Dipole moments, Quadrupole moments.

The lifetime of the 59-keV first excited state of I-127 has been measured using both xenon and tellurium parents. An average of the two results is 1.8±0.3 nsec. In addition, angular correlation studies have shown the multipolarity of the 59-keV gamma ray to be predominantly magnetic dipole with an electric quadrupole admixture of 0.6±0.6%. Angular correlation studies have also been carried out on two other cascades of I-127. One of these, the 175-200-keV cascade, showed an anisotropy of 5±3% when the Xe-127 source was in the gaseous form; but when the source was adsorbed on charcoal, an anisotropy of 30% was found. The smearing of the angular correlation is attributed to the highly ionized states of the gamma emitters resulting from electron capture. The other, the 356-59-keV cascade, exhibited an anisotropy of 0.498±0.07 after geometric corrections. This permits assignment of the value 5/2 for the spin of the 415-keV state, while the 356 gamma ray is either 9.3 or 85% electric quadrupole, depending on which of the two possible solutions is selected.

AD-613 841 Div. 20, 25

Stanford Univ., Calif.
NUCLEON-NUCLEON SCATTERING WITH INELASTIC UNITARITY,
by Philip W. Coulter, Antonio Scotti, and Gordon L. Shaw. 20 Jul 64, 6p
Contract AF49 638 1389, Grant NSF GP948
AFOSR 65-0467

Unclassified report

Pub. in Physical Review (U. S.) v136 n5B pB1399-1404 Dec 7 1964 (Copies not available to DDC or Clearinghouse customers).
Prepared in cooperation with Milan Univ. (Italy) Dept. of Physics.

Descriptors: (*Inelastic scattering, Nucleons), (*Nucleons, Inelastic scattering), Phase shift, Elastic scattering, Quantum mechanics.

The effects of inelastic unitarity on dynamical calculation of nucleon-nucleon scattering are studied, using the N/D formalism for partial-wave amplitudes modified to take into account reaction channels by means of the inelastic factor n. The equations are solved for the 1D2 amplitude for which the inelastic scattering is known (for laboratory kinetic energies E < 800 MeV) and large. We use left-hand-cut Born terms determined by Scotti and Wong. The calculated (real part of the) phase shift agrees very closely with the Scotti-Wong results for E < 200 (for reasonable choices of the high-energy behavior of n) but deviates appreciably at higher energy, peaking around 400-500 MeV and going negative at > 1 BeV. (Author)

AD-613 847 Div. 20

Stanford Univ., Calif.
RADIATIVE CAPTURE OF He3 BY Li7,
by P. Paul, S. L. Blatt, and D. Kohler.
11 Sep 64, 6p
Contracts Nonr22519, Nonr22575

Unclassified report

Pub. in Physical Review (U. S.) v137 n3B pB493-8 Feb 8 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Nuclear reactions, Helium), (*Nuclear

energy levels, Lithium), Differential cross section, Nuclear shell models, Deuteron capture, Gamma counters.

A system suitable for detection of high-energy gamma rays produced with low cross sections in the presence of high background counting rate is described. It is applied to a study of radiative capture of He3 by Li7 for bombarding energies up to 3.0 MeV. Gamma transitions to the first six states in B10 are observed and their energy dependence is measured. The excitation functions at 90 deg show peaks at 1.1 and 2.2 MeV for the transitions to the ground state and the one at 4.77 MeV, with c.m. widths of less than 500 and 420 keV, respectively. Transitions to the first and fourth excited states show a broad maximum around 1.4 MeV with a c.m. width of less than 600 keV. The cross section for the decay to 4.77 MeV is largest, with the differential cross section reaching 5 micro b/sr at the 2.2-MeV peak. At some excitation energies asymmetries Y(0 deg)/Y(90 deg) are obtained which indicate strong interferences. The peaks are interpreted as resonances and lower limits on (2J+1) gamma are presented. (Author)

AD-613 853 Div. 20, 4

California Univ., Berkeley.
HELIUM DIFLUORIDE: POSSIBLE PREPARATIVE TECHNIQUES BASED ON NUCLEAR TRANSMUTATIONS,
by George C. Pimentel, Richard D. Spratley, and Alan R. Miller. 6 Dec 63, 1p
Contract AF49 638 944
AFOSR 65-0520

Unclassified report

Pub. in Science (U. S.) v143 n3607 p674 Feb 14 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Helium, Fluorides), (*Fluorides, Helium), Feasibility studies, Theory, Tritium, Beta decay, Lithium compounds, Neutron bombardment, Alpha bombardment, Crystals, Nuclear reactions.

It might be possible to prepare difluoride by beta decay of tritium, lithium-6 transmutation, or alpha-particle bombardment. In the first method, which may be the most feasible, tritiated potassium bifluoride could be used as a host lattice. The beta-decay recoil energy would not dislodge the daughter helium atom from the host site, thus helium difluoride could perhaps be formed in an ideally shaped lattice site. (Author)

AD-613 883 Div. 20

Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.
PRODUCTION OF HYPERFRAGMENTS BY THE INTERACTIONS OF 1.5-GeV/c K(-)MESONS IN LITHIUM-LOADED EMULSIONS,
by M. J. Beniston, R. Levi Setti, W. Puschel, and M. Raymund. 13 Dec 63, 8p
Grant AF AFOSR556 64
AFOSR 65-0510

Unclassified report

Pub. in Physical Review (U. S.) v134 n3B pB641-8 May 11 1964 (Copies not available to DDC or Clearinghouse customers). Prepared in cooperation with Chicago Univ., Ill. Dept. of Physics.

Descriptors: (*Hyperons, Nuclear reactions), (*K mesons, Lithium), (*Spallation, Hyperons), Pions, Nuclear binding energy.

Hyperfragment production by some 31 000 interactions of 1.5-GeV/c K(-)mesons in Lithium-loaded K5 nuclear emulsions has been studied and compared with data from 0.8-GeV/c and existing data from 1.5-GeV/c K(-)interactions in normal emulsions. The study of the prong number distributions of the hyperfragment parent stars provides a sensitive method for determining the production rates of hyperfragments by K(-)interactions with light (C,N,O) and heavy (Ag,Br) emulsion nuclei; these production rates are found to be (0.66±0.11)% and (5.20±0.20)%, respectively. An appreciable proportion of mesonic hyperfragments (Z<6) and Li8 fragments have very short ranges (R < or = 10 microns); this fact indicates the possibility of contaminations of 'light' hypernuclides among the assumed mesic spallation hyperfragments. The predominant part of th hyperfragment production stars which shows the emission of 'short' prongs involves the disintegration of heavy nuclei, thus indicating that Coulomb-barrier criteria cannot be used in discriminating among light or heavy hyperfragment parent stars at high K(-)momenta. No double hyperfragment was observed. One K(-)interaction emitted two hyperfragments decaying nonmesically. The positive pion decay of a lambda He4 hyperfragment has been found. An estimate of the branching ratio R of the positive pion decay and negative pion decay modes for the lambda He4 hypernucleus gives R< or = (2.7±1.1)%. (Author)

AD-613 904 Div. 20

Illinois Univ., Urbana.
K- ABSORPTION AND THE Y(0)*,
by R. L. Schult and R. H. Capps. 19 Oct 61, 12p
Grant NSF G17428

Unclassified report

Pub. in Nuovo Cimento (Italy) v23 (Ser10) p416-27 Jan 16 1962 (Copies available only to DDC users).

Descriptors: (*Meson capture, K mesons), (*Nuclear resonance, Meson capture), Hydrogen, Deuterium, Helium, Hyperons, Pions, Nuclear Scattering, Resonance scattering.

A simplification is given of the relationship between a pion-hyperon resonance and the discrepancy in the K(-)-H and K(-)-D absorption data. The K(-)-helium data are shown to give supporting evidence to the resonance proposal. The recently discovered Y(0)* may be the resonance in question. It is shown that in the zero model, the real part of the isotopic spin zero scattering length must be less than -- 1.3 fermi in order to explain the hydrogen-deuterium discrepancy. (Author)

21. Nuclear Propulsion

AD-613 471 Div. 21
CFSTI Prices: HC$4.00 MF$0.75

General Dynamics/Fort Worth, Tex. Nuclear Aerospace Research Facility.
ANALYSIS OF ASTR RADIATION HEATING IN AEROSPACE STRUCTURAL MATERIALS.
Technical rept. for 1 Oct 63-30 Sep 64,
by I. C. Roberts and D. A. Goodwin. Feb 65, 105p
Rept. no. FZK-202
Contract AF29 601 6213, Proj. 6773, Task 677301 -
WL TR-64-152 Unclassified report
Descriptors: (*Nickel alloys, Radiation damage), (*Aluminum, Radiation damage), (*Polyethylene plastics, Radiation damage), (*Radiation damage, Heating), Reactor shielding materials, Borates, Lead, Partial differential equations, Heat transfer, Thermal conductivity, Test reactors, Programming (Computers), Spacecraft, Neutron cross sections.

The heat generated in the material used for shielding and structure constitutes an important problem associated with the use of nuclear energy in aerospace missions. The calculation of the heat generated involves the use of computer codes based on the differential energy spectra obtained by a moments-method solution of the Boltzmann transport equation. The solution yields a modified spectrum at a specified point from a given source point after penetration of a multilayer shield. A summation of the spectra from all the source points gives the total spectrum. Integration of the spectrum over energy, with the use of the proper energy-absorption coefficients, gives the heat deposition rate in the test materials. To evaluate the calculational methods, some typical shielding and structural materials were irradiated by the Aerospace Systems Test Reactor (ASTR) at the Nuclear Aerospace Research Facility (NARF). The materials tested in this experiment were Inconel-X, aluminum, and 6% borated polyethylene. The difference between the calculated and measured data is less than 20% of the measured value for Inconel-X and aluminum but is larger for the borated polyethylene. (Author)

22. Ordnance

AD-613 185 Div. 22, 6
CFSTI Prices: HC$5.00 MF$1.25

Frankford Arsenal, Philadelphia, Pa.
ANTITANK WEAPON SYSTEM APPLICATION OF IMPULSE CONTROL AND SEMIACTIVE HOMING.
Rept. for Dec 60-Oct 62,
by R. E. Donnard, S. J. Fenton, and A. P. Stoliar.
Apr 64, 191p Rept. no. R-1721 Unclassified report
Proj. 1A523801A305
Prepared in cooperation with Technical Analysis Group, Inc., Contract DA36 038AMC969A. Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Antitank ammunition, Homing devices), (*Homing devices, Antitank ammunition), Weapon systems, Terminal ballistics, Terminal guidance, Projectile trajectories, Control systems, Force (Mechanics), Loading (Mechanics), Pitch (Motion), Drag, Roll, Yaw, Damping, Stresses, Noise, Signals, Amplifiers, Semiconductors, Trigger circuits, Wind tunnels, Power supplies, Effectiveness.

A supporting research program was initiated at Frankford Arsenal to examine a weapon system concept, known as POLCAT, which utilizes semiactive homing and terminal projectile control. The ultimate objective of this work was to demonstrate the functional feasibility of the POLCAT system by firing projectiles from a gun and correcting their trajectories into an illuminated target by operation of projectile guidance and control elements. This information serves to support current work being conducted by Frankford Arsenal in the development of weapon systems which utilize semiactive homing and terminal projectile control. (Author)

AD-613 479 Div. 22
CFSTI Prices: HC$4.00 MF$0.75

Harry Diamond Labs., Washington, D. C.
TIMING MOVEMENT, MECHANICAL: XM26, EVALUATION TESTS,
by David S. Bettwy, Albert B. Parks, and Harold L. Hines, Jr. 5 Feb 65, 106p TR-1200
Projs. 1P222901A207, 41600
Unclassified report

Descriptors: (*Timing devices, Arming devices), (*Fuze functioning elements, Timing devices), Servomechanisms, Quality control, Designs, Performance (Engineering), Analysis.

A self-starting mechanical timing movement has been redesigned to overcome timing problems that existed in T3019 arming programmers. The redesigned unit, designated XM26, has been subjected to an extensive evaluation program, using 500 production-line movements. Based on this evaluation, the new design is capable of replacing its predecessor, the T3 timing movement. The XM26 is an extremely reliable self-starting movement that delivers 5 oz-in. of useful output torque for the first revolution of its output shaft-a nominal 90 ± 2 sec over its required operating range of -65 to +185F. An analysis of the data obtained with the new unit indicates that a timing tolerance within 90 ± 1 sec is attainable with careful adjustment during fabrication. Specifically detailed in this report are the XM26 test results and their statistical analysis. Also included is a brief summary of the design changes and recommendations for futher design improvements. (Author)

AD-613 599 Div. 22, 9
CFSTI Prices: HC$2.00 MF$0.50

General Electric Co., Burlington, Vt. Missile and Armament Dept.
FLUID TIMER FOR ORDNANCE APPLICATIONS.
Quarterly rept. no. 1, (phase 2),
by R. A. Kantola and R. T. Ziemba. 28 Feb 65, 44p
GE document no. 65APB4-1
Contract DA19 020AMC0213A, Proj. 1N022601A085
Unclassified report

See also AD-600 661.

Descriptors: (*Timing devices, Ordnance), (*Pneumatic servomechanisms, Timing devices), (*Fluid mechanics, Timing devices), Fluid flow, Oscillators, Circuits, Amplifiers, Projectiles, Arming devices.

Program goals are to develop a miniaturized pneumatic timer and demonstrate the functional feasibility. Fluid amplifiers are used throughout the timer, thus providing a no-moving-parts device with inherent ruggedness and reliability. The timing function is provided by a binary counter that is driven by an oscillator. Variable time durations are achieved by presetting the counter. This phase of the program is divided into two parts. One part is devoted to the oscillator which provides the basic time reference. The large oscillator (0.04 inch nozzle size) was improved so that an accuracy of ± 0.5% was achieved for a 5:1 range of supply pressures. The other part is devoted to miniaturization of the counter circuit. The preliminary design work on the counter was completed. Scaled down circuits (0.010 inch nozzle size) were tested to determine steady state stability and reset characteristics. Results thus far are satisfactory.

AD-613 674 Div. 22, 2, 20, 30
CFSTI Prices: HC$6.00 MF$1.25

Air Force Weapons Lab., Kirtland AFB, N. Mex.
SIMULATION OF AIR-BLAST-INDUCED GROUND MOTIONS (PHASE II).
Rept. for 1 Jul 64-1 Feb 65,
by Harry E. Auld, Gerald P. D'Arcy, and Gerald G. Leigh. Apr 65, 228p WL TR-65-26, vol. 1
Proj. 5710, Task 13 166
Unclassified report

Descriptors: (*Nuclear explosions, Seismic waves), (*Airburst, Simulation), (*Seismic waves, Simulation), Test methods, Detonating cord, Soil mechanics, Shock waves, Velocity, Stresses, Instrumentation, Pressure gages, Accelerometers.

Results from the Phase II, Long-Duration High-Explosive Simulation Technique (LDHEST) experiment are presented. This experiment simulates the air-blast-induced ground motions from a large-yield nuclear weapon over a plan area 96 feet by 150 feet. A specially designed matrix of primacord was utilized to produce the desired explosion in a confined volume of air. An overburden, or mass of material, was placed over the explosion to provide a reaction force to shape the resulting wave pulse and to provide the required long durations. The experiment produced an air pressure pulse which had a peak overpressure of 312 psi, a time to one-half peak pressure of 18.2 msec, and a total duration of 170 msec. The shock front traveled at an average velocity of 5,120 ft/sec. On the basis of these results, recommendations are made for future simulation experiments. The measured earth free-field motions and stresses are compared with theoretical calculations, and the validity of the technique for simulating the desired nuclear environment is established. (Author)

AD-613 697 Div. 22, 25
CFSTI Prices: HC$3.00 MF$0.75

Denver Research Inst., Colo.
PREDICTION OF THE THEORETICAL BEHAVIOR AND ENERGY TRANSFER WHEN SOLIDS ARE SUBJECTED TO EXPLOSIVE LOADING.
Summary rept. no. I, 29 Jun-29 Dec 64,
by Donald C. Tucker, William R. Orr, and Chester R. Hoggatt. 29 Jan 65, 73p
Contracts DA28 017AMC1399A, DA28 017AMC1400A
Unclassified report

Descriptors: (*Solids, Fragmentation), (*Fragmentation, Solids), (*Explosion effects, Solids), Model theory, Velocity, Fragmentation ammunition, Mathematical prediction, Shock (Mechanics), Detonation waves.

A technique to describe the mode of fragmentation and the vector velocity of the fragments from a center initiated cylindrical charge has been proposed in this program. The approach taken permits a determination of these variables from the shape of the case at the instant of breakup. The determination of the shape of the cylinder at various increments of time has been obtained by solving the equations of motion for an explosively loaded cylindrical wall. From the shape of the wall both radial and longitudinal strains can be obtained and a probabilistic method for determining fragment size and number is presented. By considering both the shape and acceleration of the wall at the moment of breakup, a method for obtaining the velocity and direction of the fragments is proposed. A brief review and discussion of past developments for theoretical and empirical determinations of fragmentation characteristics which include fragment size, number, distribution, and velocity is also presented. (Author)

23. Personnel and Training

AD-613 271 Div. 23, 30
CFSTI Prices: HC$1.00 MF$0.50

System Development Corp., Santa Monica, Calif.
SDC PERSONNEL DATA RETRIEVAL TIME-SHARING SYSTEM.
16 Mar 65, 8p Rept. no. SP-2008

Unclassified report

Descriptors: (*Personnel, Data processing systems), (*Data processing systems, Personnel), Programming (Computers), Personnel management, Information retrieval, Teletype systems, Data.

The Personnel Data Retrieval Time-Sharing System, using the ECCO program, operates under the AN/FSQ-32 Time-Sharing System to provide an on-line inquiry capability for searching personnel data files and outputting the required information. The inquiry capability is provided by an on-line Model 28 or Model 33 teletype send-receive set. This equipment allows the inquirer to insert the commands, control information, and search parameters required for the data retrieval. The system provides three basic capabilities for processing personnel information items contained in the data base. These are: (1) A generalized search capability whereby individuals with various backgrounds and characteristics may be identified from the data base. (2) A list capability is provided which allows the operator to specify a print-out of any of the information contained in each individual's record in a variety of formats. (3) A capability is provided to perform two statistical operations on any quantified items of information in the data base. The two statistical routines are the arithmetic mean and the range.

AD-613 333 Div. 23
CFSTI Prices: HC$2.00 MF$0.50

Personnel Research Lab. (6570th) Aerospace Medical Div., Lackland AFB, Tex.
USAF OFFICER CAREER DECISIONS: PREDICTABILITY OF INITIAL CAREER INTENT,
by Faye Ewing and Ray W. Alvord. Feb 65, 29p
PRL TR-65-2
Proj. 7719, Task 771904

Unclassified report

Descriptors: (*Officer personnel, Decision making), (*Air force personnel, Decision making), (*Decision making, Officer personnel), Probability, Motivation, Attitudes, Background, Psychometrics, Correlation techniques.

A survey sample of newly-commissioned officers drawn from all procurement sources completed a questionnaire concerned with personal data and attitudes toward and Air Force career. Responses were validated against the criterion item of stated career intent. A key developed on half of the sample was applied to the other half with a resulting correlation of .43 between the empirical score and statement of expressed career intent. Descriptions of career and noncareer officers emerged from response frequencies to the personal and biographical items. More of the noncareer entering officers are single, had a stable home life, were in the upper third of their class, attended private schools, and had a specialized college major; while more of the career officers are married, had a transient home life, began working early, attended state universities, and were in the middle third of their class. A previously derived 'Retainability Score' proved only moderately predictive of expressed career intentions. Sources with the most favorable career-noncareer ratios were the service academies and the now-defunct Officer Candidate School. These ratios determined at time of commissioning formed much the same pattern and were only slightly higher than actual retention ratios previously determined for other samples. (Author)

AD-613 459 Div. 23
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
AUTHORITATIVE REQUIREMENTS OF TIME, ON THE SUBJECT OF INCREASING THE SCIENTIFIC LETTERS OF MILITARY LEADERSHIP,
by M. V. Zakharov. 22 Mar 65, 14p FTD-TT-65-182
TT 65-61950

Unclassified report

Unedited rough draft trans. from Krasnaya Zvezda (USSR) 1965, no. 28 (12551) 4 Feb, p. 2-3.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Leadership, Scientific personnel), (*Military personnel, Leadership), Military training, Communism, USSR.

General philosophy on the value of scientific leadership in the military.

AD-613 476 Div. 23

Personnel Research Lab. (6570th), Aerospace Medical Div., Lackland AFB, Tex.
A JOB ANALYSIS OF A COMPLEX UTILIZATION FIELD: THE R AND D MANAGEMENT OFFICER,
by Joseph E. Morsh, M. Joyce Giorgia, and Joseph M. Madden. Jan 65, 69p PRL-TR-65-1
Proj. 7734, Task 773401

Unclassified report

Available only for reference use at DDC Field Services. Copy is not available for public sale.

Descriptors: (*Job analysis, Management engineering), (*Management engineering, Job analysis), (*Officer personnel, Job analysis), Personnel management, Air force personnel, Engineering personnel, Scientific personnel, Supervisory personnel, Research program administration, Education, Training, Background, Iterative methods, Tables.

Using data collection procedures developed for airman career fields, the 6 specialties in the R and D Management Utilization Field were surveyed. A job inventory composed of 373 task statements and a Background Information Sheet was developed and mailed to all Air Force R and D Management officers. Analysis of 825 completed inventories by an iterative grouping technique allocated 675 of the officers' jobs to 27 job types, each including at least 5 jobs. The dominant job type (R and D Manager) included nearly half of the R and D Management officers. Most of the job types cut across grade levels and organization levels. Reported minimum academic requirements were a bachelor's degree with major in science or engineering. Some officers considered graduate training in management or administration desirable and some suggested additional experience in operational commands. The incumbent officers averaged more experience and education than they judged to be minimal. An appendix gives the computer printouts of job descriptions for two of the identified job types: R and D Project Staff Officer, Foreign Technology Staff Officer. (Author)

AD-613 522 Div. 23
CFSTI Prices: HC$2.00 MF$0.50

Human Resources Research Office, George Washington Univ., Alexandria, Va.
AN ANNOTATED BIBLIOGRAPHY ON PROFICIENCY MEASUREMENT FOR TRAINING QUALITY CONTROL.
Research memo.,
by Robert G. Smith, Jr. Jun 64, 29p
Contract DA44 188AR02

Unclassified report

Descriptors: (*Bibliographies, Training), (*Training, Quality control), (*Quality control, Training), Effectiveness, Tests, Test methods, Handbooks.

The bibliography was prepared to provide a basis for a practical manual on quality control in training. References have been listed alphabetically by author within five categories: (I) GENERAL: General papers on proficiency measurement, achievement testing, rationales, and bibliographies; (II) TEST MANUALS: Complete manuals for testing programs or performance tests; (III) TEST METHODS: Studies evaluating or describing test methods; (IV) QUALITY CONTROL SYSTEMS: Descriptions of the rationales and procedures for complete quality control systems; (V) TEST DEVELOPMENT AND DESCRIPTION: Reports describing tests of various kinds and their development.

AD-613 629 Div. 23, 15
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
THE MATHEMATICAL CONTENT OF THE BUSINESS SCHOOL CURRICULUM,
by David Novick. Mar 65, 21p P-3083

Unclassified report

Prepared for presentation at the Annual meeting of the American Association of Collegiate Schools of Business to be held in New York City, 28-30 Apr 65.

Descriptors: (*Mathematics, Education), (*Education, Management planning), Commerce, Theory, Training, Students, Costs, Data, Computers.

A theoretical discussion is presented on the content and scope of mathematics coverage in a business school curriculum.

24. Photography and Other Reproduction Processes

AD-613 766 Div. 24

Air Force Cambridge Research Labs., Bedford, Mass.
SIMPLE HIGH SPEED KINEMATOGRAPHY OF NANOSECOND EXPOSURE,
Physical Sciences Research Papers,
by Heinz J. Fischer and Albert Fritzsche. 18 Jul 64
11p AFCRL 65-45, PSRP-75
Proj. 5634 Task 5634 01

Unclassified report

Pub. in Applied Optics (U. S.) v3 n11 p1235-7 Nov 1964.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Motion picture photography, High-speed photography), Voltage, Direct current, Germany.

Adequately timed high repetition rate nsec flashes for photographic observation of nonluminous particles of minute size are obtained by application of dc voltage, and shotrates up to 10 kc/sec are produced by such a free-firing source with a time jitter totaling about 0.3 msec. This simple method is satisfactory for the microscopic evaluation of fluid dissipation processes. Studies of the statistics of over-all fluid motion require more exact timing if evaluated by a motion picture presentation. (Author)

25. Physics

AD-613 161 Div. 25, 9
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ISOTHERMAL FLOWS OF A CONDUCTIVE GAS IN CHANNELS,
by N. I. Pol'skii and G. M. Shchegolev. 25 Mar 65, 11p FTD-TT-64-1036
TT 65-61858
Unclassified report

Unedited rough draft trans. of Teplofizika Vysokikh Temperatur (USSR) 1964, v. 2, no. 1, p. 53-57.

Descriptors: (*Magnetohydrodynamics, Numerical analysis), (*Plasma medium, Fluid flow), One-dimensional flow, Differential equations, Electrodes, Magnetic fields, Reynolds number, Thermodynamics, USSR.

AD-613 167 Div. 25
CFSTI Prices: HC$4.00 MF$0.75

Rensselaer Polytechnic Inst., Troy, N. Y.
SOME ASPECTS OF SURFACE TEMPERATURES OF SOLIDS WITH ROUGH SURFACES IN SLIDING CONTACT.
Rept. for 1 Nov 63-31 May 64,
by S. L. Pu and F. F. Ling. Aug 64, 106p
Contract AF33 657 10058, Proj. 7342, Task 734204
ML TDR-64-202
Unclassified report

Descriptors: (*Conical bodies, Surface temperatures), (*Surface temperatures, Friction), Surface properties, Stochastic processes, Heat, Surfaces, Physical properties, Graphics, Partial differential equations.

Steady-state solution of the heat equation is obtained for a truncated right circular cone with rotationally symmetrical heat input over the truncated surface and the remaining surfaces insulated. Average surface temperatures are computed for truncated cones of various opening angles. Assuming, in the first approximation, that truncated cones simulate surface asperities, then the solution may be used to give a measure of the correction factor for temperatures calculated using smooth surfaces, to give temperatures for rough surfaces. Also transient solutions of the heat equation are presented for stationary and moving bodies, respectively, with heat input considered as a simple discrete stochastic process in time and space. Numerical results show the maximum surface temperature flashes may be higher than the average surface temperature by a factor of 6. (Author)

AD-613 186 Div. 25, 30
CFSTI Prices: HC$2.00 MF$0.50

Weizmann Inst. of Science, Rehovoth (Israel).
APPARATUS FOR THE PRODUCTION OF INTENSE TRANSIENT MAGNETIC FIELDS.
Master's thesis,
by G. Menczel. 1 Jun 64, 36p Technical note no. TN-5
Contract AF61 052 654
Unclassified report

Descriptors: (*Magnetic fields, Production), Magnetic coils, Electric discharges, Capacitors, Design, Safety, Israel.

The paper describes the design of a pulsed field unit to obtain fields up to 200 KGauss inside a volume of about 5 cc. The coils are wire wound and are connected directly to a 2000 micro F capacitor bank by means of a triggered-spark-gap. The discharge in almost all the coils is oscillatory with a half period of the order of m secs. Discharge characteristics, forces acting on the coils and temperature rise during discharge are discussed. Arrangement of the capacitors in the bank, spark gap and reinforcement of coils are described. Electrical deisgns, safety features and measurement instructions are given briefly. (Author)

AD-613 193 Div. 25, 30
CFSTI Prices: HC$3.00 MF$0.50

Precision Instrument Co., Inc., Palo Alto, Calif.
COHERENT LIGHT RECORDING TECHNIQUES.
Interim rept.,
by Carl H. Becker, Siegfried Mohr, Robert J. Hull, and Erwin Hahn. Feb 65, 52p
Contract AF30 602 3272, Projs. 4505, 4291, Task 450503
RADC TR-64-523
Unclassified report

See also AD-608 719.

Descriptors: (*Lasers, Recording systems), (*Recording systems, Lasers), Broadband, Data storage systems, Photographic film, Electron optics, Deflection, Prisms (Optics), Refractive index, Barium compounds, Titanates, Potassium compounds, Tantalum compounds, Niobates, Ammonium compounds.

AD-613 197 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

Spectra-Physics, Inc., Mountain View, Calif.
HIGH POWER GAS LASER IN THE VISIBLE.
Quarterly progress rept. no. 2, 1 Oct-30 Dec 64,
by Arnold L. Bloom and Jerald E. Rosenblum.
30 Dec 64, 36p
Contract DA28 043AMC00194E, Proj. 1G622001A0560300
Unclassified report

Descriptors: (*Lasers, Gases), Argon, Krypton, Mercury, Power, Magnetic properties, Atomic energy levels, Electron transitions, Xenon, Spectra (Visible and ultraviolet).

Experimental results are reported for C-W operation in argon and krypton as a function of magnetic fields. These experiments were performed in a tube 1.5 mm in diameter and 28 cm long. A comparison is made between the results obtained with internal mirrors and those obtained with Brewster angle windows. Experiments were carried out on mixtures of gases to determine: (a) whether certain types of mixtures enhance the power output of given laser transitions, and (b) whether two laser gases could be made to operate simultaneously. It was found that in the former case the addition of mercury or neon to krypton enhanced laser operation in krypton, but that in the latter case mixtures of krypton and argon did not provide stable discharges. Spectroscopic experiments in argon and krypton lasers verified the I4 and L2 relationships at moderate powers and indicated that substantial resolution of Zeeman components occur in magnetic fields of the order of 1000 Gauss. (Author)

AD-613 205 Div. 25

Birkbeck Coll., London (England).
SEPARATION OF MOTIONS OF MANY-BODY SYSTEMS INTO DYNAMICALLY INDEPENDENT PARTS BY PROJECTION ONTO EQUILIBRIUM VARIETIES IN PHASE SPACE. I.

Rev. ed.,
by D. Bohm and G. Carmi. 10 Jul 63, 13p
Unclassified report

Pub. in Physical Review (U. S.) v133 n2A pA319-31 Jan 1964 (Copies not available to DDC or Clearinghouse customers).
Revision of rept. dated 13 Aug 62.

Descriptors: (*N-body problem, Motion), (*Motion, N-body problem), Dynamics, Projective geometry, Hamiltonian, Perturbation theory.

In two papers (of which this is the first) the central concern is to draw conclusions about the over-all dynamical properties of a many-body system. This is done without trying to solve the equations of motion, but rather, on the basis of knowledge of oscillatory or collective variables (or more generally, from the existence of conservation rules and of the uniform constants of the motion). The main result is that, corresponding to the collective coordinates (or the uniform constants of the motion) there exists a separation of the motions into two parts, one of which is collective or oscillatory, and regular, and the other of which is noncollective, nonoscillatory, and irregular.

AD-613 212 Div. 25, 4

Utah Univ., Salt Lake City.
LATTICE DEFORMATIONS IN ALKALI-HALIDE SOLID SOLUTIONS,
by B. G. Dick and T. P. Das. 26 Mar 62, 10p
Unclassified report

Pub. in Physical Review (U. S.) v127 n4 p1053-62 Aug 15 1962 (Copies not available to DDC or Clearinghouse customers)
Prepared in cooperation with California Univ., Riverside.
Work supported by ONR and NSF.

Descriptors: (*Crystal lattice defects, Alkali metal compounds), (*Alkali metal compounds, Halides), (*Solid solutions, Crystal lattice defects), Deformation, Ions, Polarization, Heat of solution, Heat of formation, Crystal growth, Nuclear magnetic resonance.

Using the Born-Mayer model, calculations on dilute solid solutions of alkali halides have been made. The systems considered are NaCl-NaBr and KBr-NaBr. In this paper ion displacements in the vicinity of an impurity atom are calculated and the results applied to the calculation of heats of solution and lattice constant changes. Electronic and ionic polarization and van der Waals interactions are included and found to be important. (Author)

AD-613 217 Div. 25, 14

Carnegie Inst. of Tech., Pittsburgh, Pa.
COOLING OF AN ANTIFERROMAGNET BY ADIABATIC MAGNETIZATION,
by J. H. Schelleng and S. A. Friedberg. 1963, 3p
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v34 n4 pt2 p1087-9 Apr 63 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR, NSF, and Alfred P. Sloan Foundation.

Descriptors: (*Antiferromagnetism, Thermodynamics), (*Thermodynamics, Antiferromagnetism), Cooling, Magnetic fields, Manganese compounds, Bromides, Water, Powders, Heat capacity.

The heat capacity of powdered $MnBr_2 \cdot 4H_2O$ has been measured between 1.4 and 20K in applied magnetic fields up to 24 kOe. The shift of the Neel point to lower temperatures with increasing field has been observed. A series of adiabatic magnetization measurements from initial temperatures above and below the zero field Neel point has been carried out. For temperatures below the Neel point (0) the anticipated cooling effect is observed for applied fields smaller than that required to make the salt paramagnetic. Adiabatic data have been used to locate the curves of entropy vs temperature computed from the heat capacity relative to the curve for H = 0. (Author)

AD-613 218 Div. 25, 4

Carnegie Inst. of Tech., Pittsburgh, Pa.
MAGNETIC SUSCEPTIBILITIES OF SEVERAL PARAMAGNETIC SALTS AT LIQUID He3 TEMPERATURES,
Doctoral thesis,
by J. T. Schriempf and S. A. Friedberg. 2 Aug 63, 7p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v40 n2 p296-302 Jan 15 1964 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF and ONR.

Descriptors: (*Paramagnetic materials, Magnetic properties), (*Cryostats, Design), Salts, Chromium compounds, Chlorides, Hydroxides, Cobalt compounds, Nickel compounds, Manganese compounds, Acetates, Hydrates, Cryogenics, Powders, Nuclear spins, Hamiltonian.

A cryostat is described in which magnetic susceptibility measurements may be made by an audio-frequency mutual induction technique at temperatures down to 0.35K. Below 2K the specimens are in direct contact with liquid He(3). Results of measurements on several compounds are presented. The powder susceptibility of $(Cr_3(CH_3COO)_6(OH)_2)Cl \cdot 8H_2O$ was found to obey a Curie-Weiss law. Both powdered $Co(CH_3COO)_2 \cdot 4H_2O$ and powdered $Ni(CH_3COO)_2 \cdot 4H_2O$ are observed to be paramagnetic to the lowest temperatures attained; the former salt does not exhibit the anomaly at 0.6K found in earlier studies employing a magnetic cooling technique. The powder susceptibility of $Mn(HCOO)_2 \cdot 2H_2O$ suggests the existence of significant coupling among many of the Mn^{++} moments, but no evidence was found of a cooperative transition above 0.56K. (Author)

AD-613 219 Div. 25, 4

Carnegie Inst. of Tech., Pittsburgh, Pa.
THEORY OF SEPARATED ELECTRON PAIRS,
by Joe M. Parks and Robert G. Parr. 25 Mar 57, 11p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v28 n2 p335-45 Feb 1958 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF and Office of Ordnance Research.

Descriptors: (*Electrons, Chemical bonds), (*Atomic orbitals, Chemical bonds), (*Chemical bonds, Atomic orbitals), Molecular properties, Valence, Atomic charge, Atomic energy levels, Quantum mechanics, Physical chemistry.

It is shown that the electronic energy of a system of separated electron pairs may be written in a particularly simple form, and the problem of determining the best

separated electron-pair description of a particular molecule is discussed. The best orbital description of an electron-pair bond is defined to be the best wave function for the pair that can be built from two atomic orbitals, one on each of two atoms. Systematic adjustment of individual pair descriptions one at a time is shown to provide a rigorous yet practicable procedure for obtaining best orbital descriptions for several separated electron-pair bonds in a molecule. The equations obtained are shown to simplify considerably when Mulliken approximations are introduced for certain electronic repulsion integrals. Under these approximations a single property of each bond is shown to dominate its effect on other bonds, the net charge transferred from one atom to the other in the bond. This charge is called the bond polarity parameter. The equations are rewritten in terms of polarity parameters, and a scheme is thereby obtained which is convenient for discussion of intrabond charge transfer effects in a molecule. Formulas are given for the terms to be added to the absolute electronegativity of an atom in a bond to correct for charge transfers in other bonds. It is shown that the total molecular energy of a system of separated electron-pair bonds can be expressed quite rigorously as a sum of bond energies, and the approximate invariance of bond energy to molecular environment is verified. Limitations of the assumption of separability and methods for transcending it are discussed. (Author)

AD-613 220 Div. 25

Chicago Univ., Ill.
PROPOSED STANDARD WAVELENGTHS IN THE VACUUM ULTRAVIOLET. SPECTRA OF Ge, Ne, C, Hg, AND N,
by P. G. Wilkinson and K. L. Andrew. 14 Aug 62, 9p
Contract AF19 604 3478
Unclassified report

Pub. in Optical Society of America. Journal (U. S.) v53 n6 p710-7 Jun 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Spectra (Visible and ultraviolet), Standards), (*Germanium, Ultraviolet spectroscopy), (*Neon, Ultraviolet spectroscopy), (*Carbon, Ultraviolet spectroscopy), (*Mercury, Ultraviolet spectroscopy), (*Nitrogen, Ultraviolet spectroscopy), Vacuum apparatus, Atomic energy levels.

The spectrum emitted from a germanium hollow-cathode discharge was photographed at high dispersion in the third order of a 21-ft concave grating spectrograph. Emission lines of Ge II, Ne II, Hg I, Hg II, C I, and N I were measured against Ge I Ritz standards in the regions 1550-2041 A and 2325-3060 A. The Ge I Ritz standards were investigated as to their suitability, and it was found that 56 lines in the region 1650-2041 A may be used with confidence to ±0.0004 A. Fifty-eight interpolated lines of Ne, Hg, C, N, and Ge may be used as auxiliary standards to ±0.001 A in the region 1550-2041 A. The interpolated measurements in the region 2325-3030 A provide 74 lines with a standard error of ±0.002 A which also may be useful. The present investigation of the Ge II spectrum has provided revised energies for 15 levels. From these levels and 12 additional levels from the recent work of Kaufman and Andrew, the wavelengths of 22 lines in the region 837-1602 A have been calculated with an estimated uncertainty of ±0.0004 to ±0.0018 A. (Author)

AD-613 224 Div. 25, 4

Carnegie Inst. of Tech., Pittsburgh, Pa.
WHY NOT USE SLATER ORBITALS OF NONINTEGRAL PRINCIPAL QUANTUM NUMBER,
by Robert G. Parr and Hubert W. Joy. 5 Nov 56, 1p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v26 n2 p424 Feb 1957 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF.

Descriptors: (*Atomic orbitals, Quantum mechanics), (*Molecular structure, Atomic orbitals), Molecular properties.

It is shown that improved accuracy in molecular calculations can be achieved by dropping the restriction that the principal quantum numbers of Slater orbitals be integers.

AD-613 225 Div. 25, 4

Catholic Univ. of America, Washington, D. C.
DIELECTRIC PROPERTIES OF GLYCEROL, WATER MIXTURES,
by G. E. McDuffie, Jr., R. G. Quinn, and T. A. Litovitz. 26 Dec 61, 4p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v37 n2 p239-42 Jul 15 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and ONR.

Descriptors: (*Alcohols, Dielectric properties), Relaxation times, Water, Mixtures, Viscosity.

The frequency dependence of the complex dielectric constant of glycerol-water mixtures has been measured in the megacycle frequency range at -7.5, -15.3, and -19.5C. for various concentrations between nearly pure glycerol and an equal molar mixture. Cole-Cole plots of the data indicate a single main relaxation with an asymmetric distribution of relaxation times of the Davidson-Cole form. The limiting dielectric relaxation time of the Davidson-Cole distribution was found to be strongly dependent on the water content and to vary exponentially with the molar concentration of water. The width of the distribution of relaxation times is independent of the concentration over the range studied and only slightly temperature dependent. The average dielectric relaxation times of the mixtures were extrapolated to 100% water. The dielectric relaxation time of water obtained by this extrapolation agrees satisfactorily with the measured value, indicating a smooth transistion between the average relaxation time of pure glycerol and pure water, as well as indicating a change in the distribution of times from that of the Davidson-Cole form to a single time. These experimental findings can be explained in terms of the 'group' concept of Schallamach in which it is assumed that in mixtures of associated-associated liquids, such as glycerol and water, dielectric orientation occurs through a cooperative effect in groups of molecules, these groups containing molecules of both kinds. The concentration dependence of the dielectric relaxation time is also compared to that of viscosity. The comparison indicates that the variation of dielectric times with water content is similar to, but not exactly the same as, the variation of viscosity. (Author)

AD-613 226 Div. 25, 4

Catholic Univ. of America, Washington, D. C.
DIELECTRIC RELAXATION IN ASSOCIATED LIQUIDS,
by G. E. mcDuffie, Jr. and T. A. Litovitz. 9 May 62, 7p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v37 n8 p1699-1705 Oct 15 1962 (Copies not available to DDC or Clearinghouse customers).
Sponsored by NSF and ONR.

Descriptors: (*Alcohols, Dielectric properties), Relaxation times, Measurement, Viscosity, Temperature.

The dielectric properties of the associated liquids butanediol 1,3, 2-methyl pentanediol 2,4, glycerol, and hexanetriol 1,2,6 were measured over the temperature range -20 to + 10C, and over a frequency range of 0.01 to 1200 Mc/sec. Dielectric relaxation times and their distributions were determined and indicate the following: (a) All four liquids exhibit an asymmetric distribution of relaxation times of the Davidson-Cole form. (b) With the exception of hexanetriol 1,2,6, the distribution of relaxation times becomes narrower with increasing temperature. It is proposed that groups (regions of appreciable order) exist in these liquids, and that dielectric orientation is closely related to the structural breakup of these groups, this breakup being a necessary condition for dipole reorientation. It is further proposed that the structural breakup is a cooperative process which does not proceed exponentially, therefore giving rise to a nonexponential decay of dielectric polarization. This concept offers an explanation for the observed distribution of relaxation times. The temperature dependence of the width of the distribution is explained by assuming that the group-size decreases with increasing temperature, and that as the groups become smaller, the structural-decay process becomes more exponential. (Author)

AD-613 227 Div. 25

Syracuse Univ., N. Y.
INEQUIVALENT HAMILTONIAN FORMALISMS IN ELECTRODYNAMICS.
Revised ed.,
by Melvin Schwartz. 7 Feb 63, 10p
Unclassified report

Pub. in Physical Review (U. S.) v130 n4 p1595-1604 May 15 1963(Copies not available to DDC or Clearinghouse customers).
Prepared in cooperation with Adelphi Univ., Garden City, N. Y.
Supported by WADC and NSF.
Revision of rept. dated 18 Jun 62.

Descriptors: (*Hamiltonian, Selection rules), (*Charged particles, Selection rules), (*Harmonic oscillators, Charged particles), Fourier analysis, Green's function, Quantum mechanics.

In treating the electric dipole approximation of a charged particle undergoing self-interaction, it is shown how, in the cases of a charged free particle and a charged oscillator, the same equations of motion may be derived from two inequivalent Hamiltonian formalisms. The first formalism is the Dirac formalism of Schiller and Schwartz, which must be satisfied by all configuration space solutions generated by the total Hamiltonian. It is pointed out that in order to ensure that the configuration space solutions are consistent with the latter formalism, one must recognize that the constraints impose modifications on the commutation rules satisfied by averaged field variables. While the first formalism is general, the second formalism can be constructed only after one has solutions expressed in terms of a Fourier decomposition of the radiation field. The second formalism is an interaction picture formalism where the radiation field part of the total Hamiltonian is the generator of time translations. The latter formalism is used to give a new derivation of Kramers' integral for the zero-point level shift of an oscillator. (Author)

AD-613 231 Div. 25

Duke Univ., Durham, N. C.
REMARKS ON THE RELATIVISTIC KEPLER PROBLEM.
Revised ed.,
by L. C. Biedenharn. 18 Dec 61, 7p
Unclassified report

Pub. in Physical Review (U. S.) v126 n2 p845-51 Apr 15 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by Army Research Office and NSF
Revision of rept. dated 16 Nov 61.

Descriptors: (*Relativity theory, Electrons), (*Electrons, Relativity theory), (*Special functions (Mathematical), Motion), Atomic orbitals, Momentum, Quantum mechanics.

By means of a new representation, the Dirac-Coulomb spherical wave functions are treated in a manner which brings out the close formal similarity between these solutions and the spherical wave solutions for the free-electron problem. The radial functions in the new representation have the same form as the nonrelativistic radial Coulomb functions, but with an irrational orbital 'angular momentum'. This representation is utilized to deduce a general recursion relation for radial Coulomb eigenfunctions, and show the existence of the Coulomb helicity operator as a constant of the motion. The advantages and properties of this formulation are discussed briefly. (Author)

AD-613 232 Div. 25

California Univ., Riverside.
NUCLEAR QUADRUPOLE INTERACTIONS IN ALKALI-HALIDE SOLID SOLUTIONS,
by T. P. Das and B. G. Dick. 26 Mar 62, 14p
Unclassified report

Pub. in Physical Review (U. S.) v127 n4 p1063-76 Aug 15 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF and ONR
Prepared in cooperation with Utah Univ., Salt Lake City.

Descriptors: (*Nuclear magnetic moments, Alkali metal compounds), (*Solid state physics, Nuclear magnetic moments), Halides, Solids, Solutions, Quadrupole moments, Crystallography, Nuclear magnetic moments.

Nuclear quadrupole interactions in dilute alkali halide solid solutions are studied in detail using the results of the calculations in the preceding paper of the relaxation and electronic polarization of ions around the solute ion. It is hown that the available experimental data on first- and second-order effects on nuclear magnetic resonance spectra in the solid solutions NaCl-Br, NaBr-Cl, and KBr-Na can be explained quite well using calculated values of antishielding factors for the Na(+) and Br(-) ions. The electronic polarization of the ions is found to be an important contributor to the field gradients at the nuclei, the results being rather sensitive to the choice of polarizabilities for the ions. Better agreement with experiment is obtained when Sternheimer's calculated values of the polarizabilities are used rather than Tessman, Kahn, and Shockley's empirical values. For a nucleus which is quite distant from the solute ion, the ions nearest to the nucleus are seen to be more effective contributors to the field gradient at the nucleus than tehe ions near the impurity. (Author)

AD-613 233 Div. 25, 4

Washington Univ., Seattle.
INFRARED INTENSITIES OF SULFUR DIOXIDE: A RE-DETERMINATION,
by D. F. Eggers, Jr. and E. D. Schmid. 31 Aug 59, 2p
Contract AF18 600 1522
Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v64 p279-80 1960 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Sulfur compounds, Infrared spectroscopy), (*Dioxides, Sulfur compounds), Gases, Band spectrum, Measurement, Test methods, Test equipment.

An earlier report (Jour. Phys. Chem. 59:1124 (1955)) listed the IR intensities for sulfur dioxide, measured in the gas phase. Subsequent measurements agreed well with each other (Anales real soc. espan. fis. y quim (Madrid), A52:207(1956) and can. Jour. Physics, 35:954 (1957)). The first measurements were about 30 to 40% lower than the later ones. Re-examination of the original spectral recordings and calculations disclosed no errors; therefore a complete-re-measurement of these intensities was undertaken. The limits of error in the measurements was estimated to be about 10%. This is appreciably larger than the scatter of the points for the spectra bands but is based upon the uncertainty in reproducing the 100% line, i.e., with no absorbing materials in the cell. The over-all agreement of the present measurements with those of the other reports is quite good, and indicates that earlier measurements were consistently too low.

AD-613 234 Div. 25, 4

Oregon State Univ., Corvallis.
TRANSFERENCE EXPERIMENTS ON LEAD AND THALLOUS IONS IN POTASSIUM CHLORIDE CRYSTALS.
Doctoral thesis,
by William J. Fredericks and Allen B. Scott.
29 Oct 57, 4p Research paper no. RP-326
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v28 n2 p249-52 Feb 1958 (Copies not available to DDC or Clearinghouse customers).
Supported by OOR and NSF.

Descriptors: (*Crystal lattice defects, Luminescence), (*Luminescence, Crystal lattice defects), (*Potassium compounds, Chlorides), (*Lead, Ions), (*Thallium, Ions), Complex compounds, Electrolysis, Transport properties, Valence, Chemical bonds, Lead compounds, Thallium compounds.

The electrolytic migration of lead and thallium in potassium chloride crystals to which small additions of lead chloride and thallous chloride were made was studied in a transference experiment. Lead was found to migrate toward the anode, indicating that it is bound in a negatively charged complex. Thallium did not migrate appreciably at temperatures below 600C; at higher temperatures it moved toward the cathode. Thallium clearly may exist as the simple cation at elevated temperatures; however, the results at lower temperatures do not permit a conclusion to be drawn with certainty regarding the existence of complex ions. (Author)

AD-613 235 Div. 25, 4

Sloane Physics Lab., Yale Univ., New Haven, Conn.
OSCILLATIONS OF LIQUID HELIUM IN A U-TUBE,
by R. J. Donnelly and O. Penrose. 11 May 56, 8p
Unclassified report

Pub. in Physical Review (U. S.) v103 n5 p1137-44 Sep 1 1956 (Copies not available to DDC or Clearinghouse customers).
Supported by OOR and NSF.

Descriptors: (*Helium, Liquefied gases), (*Liquefied gases, Oscillation), (*Oscillation, Liquefied gases), Cryogenics, Damping, Friction, Viscosity, Fluid dynamic properties.

Frictional forces in He II were studied by observing the decay of free oscillations in a U-tube. The decay, unlike that for ordinary liquids (including He I), is characterized by two logarithmic decrements: one for amplitudes of oscillation below about 0.1 cm, and another for amplitudes between about 0.2 and 1 cm. The values of these two decrements agree with the results of a hydrodynamical calculation which assumes that for the lower range of amplitudes the two-fluid equations of Landau and Tisza hold, and that for the other range of amplitudes the normal and superfluid components have identical velocity fields. The values for the viscosity coefficient deduced from the observations agree roughly with each other and with the published results of other methods. Despite the large experimental error, there is evidence that the viscosity when the two components move together is higher than the viscosity of the normal component when the two-fluid equations hold, the ratio being about 1.33:1. The transition between the two types of behavior is fairly sharp near the lambda point but becomes diffuse as the temperature is lowered to 1K. At a given temperature, the transition appears to be sharper the more gentle the bend of the U-tube, that is, the more uniform the velocity over the walls of the tube. (Author)

AD-613 236 Div. 25, 4

North Carolina Univ., Chapel Hill.
BAND STRUCTURE AND TRANSPORT OF HOLES AND ELECTRONS IN HOMOLOGS OF ANTHRACENE,
by G. D. Thaxton, R. C. Jarnagin, and M. Silver.
25 May 62, 5p
Unclassified report

Pub. in Journal of Physical Chemistry (U. S.) v66 p2461-5 Dec 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by ARO(D) and NSF.

Descriptors: (*Semiconductors, Polycyclic compounds), (*Polycyclic compounds, Semiconductors), Field theory), Electron transitions, Transport properties, Molecular structure, Crystal structure, Atomic orbitals.

Calculations of the band structure and of the mobility of excess holes and of excess electrons in homologs of anthracene were completed. Following LeBlanc, the tight binding approximation was used and applied to naphthalene, tetracene, (Naphthacene), and pentacene. Calculated mobility tensors and band widths indicate the mobility properties of excess charge carriers in all four molecular crystals to be much alike. Experimental results for the crystals other than anthracene are not yet available. (Author)

AD-613 237 Div. 25

Amherst Coll., Mass.
NUCLEAR SPECIFIC HEAT OF HOLMIUM,
by J. E. Gordon, C. W. Dempesy, and T. Soller.
16 Jun 61, 2p
Unclassified report

Pub. in Physical Review (U. S.) v124 n3 p724-5 Nov 1 1961 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and ONR.

Descriptors: (*Holmium, Specific heat), Cryogenics, Measurement, Hyperfine structure, Paramagnetic resonance, Nuclear magnetic resonance, Nuclear spins.

The specific heat of holmium has been measured between 0.95 and 4.2K. The magnetic hyperfine interaction in holmium is so large that over this entire temperature range the nuclear hyperfine term represents the predominant contribution to the specific heat. Below 1.5K the specific heat appears to be that of an ideal paramagnetic gas of spin 7/2. At 1K the specific heat has the extremely large value of 0.37R. (Author)

AD-613 241 Div. 25

Yeshiva Univ., New York
SEPARATION OF MOTIONS OF MANY-BODY SYSTEMS INTO DYNAMICALLY INDEPENDENT PARTS BY PROJECTION ONTO EQUILIBRIUM VARIETIES IN PHASE SPACE. II,
by G. Carmi and D. Bohm. 10 Jul 63, 19p
Unclassified report

Pub. in Physical Review (U.S.) v133 n2A pA332-50 Jan 20 1964 (Copies not available to DDC or Clearinghouse customers). Revision of rept. dated 13 Aug 62. See also AD-613 205.
Supported by AFOSR and NSF.

Descriptors: (*N-body problem, Motion), (*Motion, N-body problem), Dynamics, Projective geometry, Hamiltonian, Perturbation theory, Oscillation, Plasma oscillations.

The development started in the preceding paper is continued and the many-body problem treated by separating the motion into an oscillatory part and a nonoscillatory part, the latter being obtained by a noncanonical transformation which is so tailored as to project out the oscillatory features from x sub i, p sub i, and thereby projecting x sub i, p sub i onto the equilibruim variety J sub k (x sub i, p sub i) = O (where J sub k is the oscillatory action variable) in phase space. A condensed notation in phase space is developed which facilitates calculations. The dynamics of a plasma are illustrated with the aid of a comparison with a simple tow-dimensional model. Plasma motions are explained in terms of concepts such as the generalization of the notion of centrifugal force and Coriolis force to phase space.

AD-613 242 Div. 25

Syracuse Univ., N. Y.
ENERGY DISTRIBUTION OF ELECTRONS FROM IONIZING COLLISIONS OF ATOMS AND IONS,
by H. W. Berry. 23 Apr 62, 4p
Unclassified report

Pub. in Physical Review (U. S.) v127 n5 p1634-7 Sep 1 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by ARL and NSF.

Descriptors: (*Electrons, Energy), (*Ionization, Helium group gases), Excitation, Electron transitions, Ions, Selection rules, Neon, Helium, Krypton, Xenon.

The energy distribution of electrons ejected in collisions of Ne ions with Ne and He atoms, He ions in Ne, and Kr, and Xe ions and neutral atoms in Kr and Xe, respectively, have been measured for ion energies from 0.3 to 3.0 keV. The spectra consist of a continuous distribution decreasing monotonically with electron energy, on which there are superimposed electron groups of definite energy characteristic of the colliding particles. The nature and origin of these groups are discussed. (Author)

AD-613 243 Div. 25, 15

Massachusetts Inst. of Tech., Cambridge.
SOJOURN TIMES OF DIFFUSION PROCESSES,
by Daniel Ray. 25 Jun 62, 16p
Unclassified report

Pub. in Illinois Journal of Mathematics (U. S.) v7 n4 p615-30 Dec 1963 (Copies not available to DDC or Clearinghouse customers)
Supported in part by NSF and ONR.

Descriptors: (*Diffusion, Statistical processes), (*Statistical processes, Diffusion), (*Integrals, Diffusion), Special functions (Mathematical), Probability, Transformations (Mathematics).

AD-613 247 Div. 25, 4

Florida State Univ., Tallahassee.
SUBSTITUTED BENZENE SPECTRA,
by Lionel Goodman and Harrison Shull. 18 Sep 57, 14p
Grant NSF G2355
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v27 n6 p1388-1400 Dec 1957 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Aromatic compounds, Band spectrum), (*Molecular spectroscopy, Aromatic compounds), Excitation, Atomic orbitals, Atomic energy levels, Theory, Integrals, Hamiltonian, Perturbation theory.

The low-lying pi-electron excited states of substituted benzenes are examined from a semiempirical point of view, by using molecular orbital theory together with first-order configuration interaction as a basis. Different semiempirical parameters are introduced for the perturbations by a substituent upon states of different symmetry. Substituents exerting conjugative, inductive, and mixed effects are considered. Comparisons with experiment show that the experimentally observed facts concerning the effect of substitution upon the energy and intensity of these transitions are well accounted for by the theory. The relationship of the present treatment to that of the perimeter model introduced by Moffitt is discussed. The present model breaks down for very 'strong' substituents when a higher-order configuration interaction treatment becomes essential. (Author)

AD-613 248 Div. 25, 15

Carnegie Inst. of Tech., Pittsburgh, Pa.
1s ORBITALS AS BASE FUNCTIONS FOR MOLECULAR CALCULATIONS,
by Robert G. Parr. 15 Oct 56, 1p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v26 n2 p428 Feb 1957 (Copies not available to DDC or Clearinghouse customers)
Supported in part by NSF.

Descriptors: (*Atomic orbitals, Molecular properties), (*Molecular properties, Atomic orbitals), Calculus of variations, Functions.

The set of all hydrogen-like 1s orbitals of all

possible effective charges centered at all possible points in space is a complete set of one-electron functions. The exact electronic wave function for any molecule can be expressed in terms of these functions, and they also may serve in place of others in simpler contexts. Calculations which illustrate the possibilities are given.

AD-613 249 Div. 25

Illinois Univ., Urbana.
RENORMALIZATION OF TIME-ORDERED GREEN'S FUNCTIONS,
by K. Nishijima. 12 May 61, 9p
Unclassified report

Pub. in Physical Review (U. S.) v124 n1 p255-63 Oct 1 1961 (Copies not available to DDC or Clearinghouse customers).
Supported in part by ONR and AEC.

Descriptors: (*Green's function, Field theory), (*Field theory, Green's function), Meson reactions, Nucleons, Perturbation theory, Mathematical models.

The renormalization of time-ordered Green's functions is carried out without reference to Feynman diagrams. The arguments are entirely based on the generalized unitarity condition and the parametric dispersion relations. The renormalization of the meson-nucleon interaction is studied, and then a close examination is given of the renormalization of quantum electrodynamics in a special gauge. Finally the connection between the subtraction constants in dispersion relations and renormalization constants is clarified in a simple model. (Author)

AD-613 250 Div. 25

Kansas Univ., Lawrence.
PARAMAGNETIC RESONANCE OF NICKEL IONS IN DOUBLE-NITRATE CRYSTALS,
by J. W. Culvahouse. 15 Nov 61, 7p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v36 n10 p2720-6 May 15 1962 (Copies not available to DDC or Clearinghouse customers)
Supported in part by NSF.

Descriptors: (*Paramagnetic resonance, Nickel), (*Nickel, Paramagnetic resonance), (*Nitrates, Crystals), Lanthanium compounds, Zinc compounds, Ions, Cryogenics, Cobalt, Cerium, Electron transitions, Crystallography, Atomic structure.

It is shown that there are two paramagnetic complexes for divalent nickel ions in the double-nitrate crystals. One, which has not been previously described, has a very large-zero field splitting: D=2.25±0.10/cm for 1% nickel in La2Zn3 (NO3)12(24H2O) at 77K, and it is shown that this complex is due to ions in the same site as that which produces the more anisotropic cobalt spectrum--the Y-ion site. The interaction between cerium ions and nickel ions in the other divalent site--the X-ion site--is shown to be different from the interaction of cerium and cobalt in the same site. The origin of the difference is explained qualitatively. (Author)

AD-613 252 Div. 25, 4

Oklahoma Univ., Norman.
INTERNAL ROTATION IN COMPLETELY ASYMMETRIC MOLECULES. I. A GENERAL THEORY AND ANALYSIS OF THE MICROWAVE ROTATIONAL SPECTRUM OF CH2DCOH, CD2HCOH, AND CHOOCH2D,
by C. R. Quade and Chun C. Lin. 31 Aug 62, 11p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v38 n2 p540-50 Jan 15 1963 (Copies not available to DDC or Clearinghouse customers).
Supported in part by NSF and ONR.

Descriptors: (*Molecular rotation, Theory), (*Microwave spectroscopy, Molecular rotation), (*Deuterated compound, Molecular rotation), Acetals, Aldaehydes, Integrals, Hamiltonian, Quantium mechanics, Molecular spectroscopy.

A theory for the internal rotation in molecules where the internal rotor is 'not' a symmetric top has been formulated. The principal feature of the theory is the expansion of the rotational constants for the molecule in a converging series of (sin to the nth power alpha and cos to the nth power alpha). This allows for the straightforward evaluation of certain integrals appearing in the development of the theory. In addition, the theory is applied specifically to CH2DCOH, CD2HCOH, and CHOOCH2D in the analysis of the microwave rotational spectra for these molecules. For CH2DCOH the height of the potential barrier hindering the internal motion is found to be V =410/cm, which is consistent with the barrier height for other species of acetaldehyde. To fit the spectra of CD2HCOH and CHOOCH2D a slight rotation of the effective principal axes must be made to obtain a consistent potential barrier. The results of the calculation indicate that (1) the theory is readily applicable in the determination of the barrier heights of the more general molecules, and (2) investigation of the deuterated-methyl internal rotors could provide information on the structure of the rotor. (Author)

AD-613 287 Div. 25, 13
CFSTI Prices: HC$3.00 MF$0.75

Air Force Weapons Lab., Kirtland AFB, N. Mex.
STEP LOAD MOVING ON THE SURFACE OF A HALF-SPACE OF A LOCKING MATERIAL: SUBSEISMIC CASE.
Rept. for Jul 63-Jan 64,
by Hans H. Bleich. Feb 65, 63p WL-TDR-64-8
Contract AF29 601 6055, Proj. 5710, Task 13 144
Unclassified report

See also AD-405 153.

Descriptors: (*Mechanical waves, Soils), (*Airburst, Soils), (*Elasticity, Loading (Mechanics)), Stresses, Strain (Mechanics), Pressure, Friction, Surfaces, Blast, Structures.

Considering a locking material prior to compaction as a special case of a nonlinearly hardening elastic material, conditions at a discontinuity--a locking front--are analyzed on the basis of three dimensional theory. This study leads to the important result that the major compressive principal stress at a locking front must always be normal to the front, even if the front is not plane. Based on this general result, the effect of a uniform step pressure traveling with subseismic velocity on the surface of a half-space is obtained for the case of a locking material which after compaction has elastic-Coulomb behavior. Such a material acts linearly elastic if the state of stress does not overcome internal friction, but slip occurs if the stresses reach a critical state defined by Coulomb friction. As a special case the solution applies also for a material which is linearly elastic after compaction. The stress,

velocity and acceleration histories due to the traveling step pressure are discussed and compared to those in the one dimensional case of a suddenly applied uniform surface pressure. (Author)

AD-613 295 Div. 25
CFSTI Prices: HC$3.00 MF$0.75

General Electric Co., Syracuse, N. Y.
AROMATIC ORGANIC LASER DEVELOPMENT.
Final rept.,
by D. L. Stockman. 1965, 76p
Contract Nonr413500, Proj. 3730, ARPA Order 306 62
Unclassified report

Descriptors: (*Lasers, Materials), (*Aromatic compounds, Lasers), Fluorescence, Phosphorescence, Impurities, Polycyclic compounds, Polymers, Oscillation, Gain, Acrylic resins, Absorption spectrum, Cavity resonators, Flash lamps.

The purpose of the program was to produce coherent stimulated emission in the blue-green region in a purely organic dopant and host system. The theoretical analysis indicates that the short lived four-level fluorescent compounds are the most suitable materials for this purpose. A total of four fluorescent compounds were found with the appropriate spectroscopic characteristics. The principal experimental difficulties included the development of a suitable host material in which the absorbing and scattering losses are kept to a minimum and an optical pump system capable of efficiently producing several megawatts of absorbable peak power in a short time. An optically isotropic polymer was developed whose properties appear to be suitable as a host material for the fluorescing species. Two optical pumping systems were used: (1) a modified Xenon lamp, and (2) an argon theta-pinch lamp. Some gain was observed in a liquid containing perylene as the active compound. This gain was observed at 4710 A and probably was due to preoscillation 'superradiance'. (Author)

AD-613 306 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Cornell Univ., Ithaca, N. Y.
SOME SOLID STATE STUDIES OF SILVER-DOPED WO3,
by M. J. Sienko and B. R. Mazumder.
19 Dec 59, 9p
Contract AF49 638 191
AFOSR TN-60-6; PB 148 690
Unclassified report

Descriptors: (*Single crystals, Impurities), (*Silver alloys, Single crystals), (*Tungsten compounds, Oxides), Solid solutions, Crystal structure, Electrical conductance, Electron transitions, Entropy, Solid state physics.

A material corresponding to Ag0.010WO3 was isolated from the thermal equilibration of WO3 with various sources of silver. Single crystal studies indicate that it is orthorhombic (a = 7.35 A, b = 3.73 A, and c = 3.85 A) and that it conducts as a metal between 25 and 600C (specific resistivity increases linearly from 0.072 ohm-cm at 25C to 0.155 ohm-cm at 600C.). The electron mobility at 25C, of 0.44 sq. cm/volt sec. is approximately the same as that previously observed in thallium tungsten bronze. It is proposed that Ag0.010WO3 represents a defect structure in which the 5 d conduction band of WO3 is populated by electrons from the silver atoms and in which a more symmetric structure of WO3 has been stabilized by configurational entropy. (Author)

AD-613 307 Div. 25, 27
CFSTI Prices: HC$3.00 MF$0.75

RCA Labs. Div., Radio Corp. of America, Princeton, N. J.
RESEARCH ON PLASMA ACCELERATION BY ELECTRIC FIELD GRADIENT.
Semi-annual technical rept. for 15 Dec 59-15 Jun 60.
Jun 60, 72p
Contract AF49 638 658, Proj. 4766, ARPA Order 6 58, Task 11
AFOSR TR-60-120
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.
See also PB-145 873.

Descriptors: (*Magnetohydrodynamics, Radiofrequency power), (*Plasma medium, Acceleration), (*Electric fields, Plasma physics), Mercury, Very high frequency, Velocity, Deceleration, Rocket propulsion.

Theoretical studies of plasma acceleration by an rf field gradient indicated that a plasma will be accelerated toward the low-field region if the applied frequency is greater than the critical frequency of the plasma, and toward the high-field region if the frequency is less than the critical frequency. Calculations for the acceleration of plasma spheres and ellipsoids of arbitrary orientation with respect to the rf field have been completed. Experiments with plasmas of various densities have demonstrated both the acceleration and deceleration of the plasmas as predicted by theory. Mercury plasma has been accelerated with a 140-Mc rf field gradient to a velocity of 25 x 100,000 cm/sec, equivalent to a specific impulse of 2500 seconds. (Author)

AD-613 308 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Michigan Univ., Ann Arbor.
KINETICS OF WHISKER GROWTH ON VANADIUM PENTOXIDE,
by V. J. Lee and G. Parravano. 1961, 24p
Contract AF49 638 493
AFOSR 828
Unclassified report

Descriptors: (*Vanadium compounds, Oxides), (*Filaments, Single crystals), (*Single crystals, Crystal growth), (*Crystal growth, Dynamics), Diffusion, Evaporation, Condensation, Crystal lattice defects, Heat of activation, Ions, Crystal structure, Sintering.

The interplay of three growth mechanisms responsible for the formation of filaments on solid surfaces is analyzed. These are: 'short circuit' diffusion within the filament body, evaporation from and condensation on the tip of the filament. Kinetic expressions for the simultaneous occurrence of the former with the latter processes are developed and typical growth behaviors are characterized. A dislocation core is used as a suitable 'short circuit' path for diffusion. Kinetic evidence is presented to show that whiskers grown on V2O5 crystals follow the derived growth patterns. Detailed rate data are reported for temperatures 500 to 650C in air, steam and vacuum. Observations on growth morphology of V2O5 whiskers are reviewed. Whenever a growing whisker collided with an adjacent crystal, rapid radial growth of the filament resulted. Thus, it is suggested that whisker growth within fine particles or pores of loose aggregates

characterizes the first stage of sintering of solid particulate systems. Mathematical expressions for each step of the kinetic sequence from whisker formation to neck growth between sintering particles of vanadium pentoxide are presented. (Author)

AD-613 310 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Syracuse Univ., N. Y. Research Inst.
INTERACTIONS OF ATOMS AND MOLECULES WITH SOLID SURFACES.
Annual and status rept. for 1 Apr-30 Sep 64,
by John W. Trischka. 30 Sep 64, 6p
Contract Nonr66909, Proj. NR014 303
Unclassified report

See also AD-612 627.

Descriptors: (*Platinum alloys, Surface properties), (*Tungsten alloys, Surface properties), (*Thermionic emission, Measurement), Wire, Electrons, Ions, Potassium compounds, Chlorides, Vacuum systems, Calcium, Atomic beams, Molecular beams.

A summary is given of work devoted to the study of Pt-W and Pt surfaces by observations of electron thermionic emission and positive ion emission. Wires of both metals show, under certain conditions, the ability to ionize K atoms, but not the K atom bound to a halogen in an alkali halide vapor. This is called a 'discriminating property.' The following work was completed: (1) The discriminating property of Pt-W surfaces, as evidenced by changes in electron emission, could be produced under ultra-high vacuum conditions, thereby demonstrating that the property is inherent in the surface and not an effect produced by ambient gas in the vacuum system. (2) The electron emission properties of discriminating and non-discriminating surfaces were compared. (3) A beam of Ca atoms was detected by the use of simultaneous Ca and KC1 molecular beams, impinging on a discriminating Pt-W wire. (Author)

AD-613 317 Div. 25, 15
CFSTI Prices: HC$2.00 MF$0.50

Brandeis Univ., Waltham, Mass.
GRAVITATIONAL-ELECTROMAGNETIC COUPLING AND THE CLASSICAL SELF-ENERGY PROBLEM,
by R. Arnowitt, S. Deser, and C. W. Misner.
1 Sep 60, 27p
Contract AF49 638 636
AFOSR TN-60-482
Unclassified report

Descriptors: (*Gravity, Electromagnetic fields), (*Field theory, Gravity), Relativity theory, Energy, Electromagnetism, Partial differential equations, Integration.

The gravitational effect on the classical Coulomb self-energy of a point charge is calculated rigorously. It is shown that the total mass then becomes finite (although still quite large), and that it depends only on the charge and not on the bare mechanical mass. Thus, a particle acquires mass only when it has non-gravitational interactions with fields of non-zero range. In order to treat this problem, it is necessary to extend the canonical formalism, previously obtained for the free gravitational field, to include coupling with the Maxwell field and the point charge system. It is shown that the canonical variables of the gravitational field are unaltered while those of the matter system are natural generalizations of their flat space forms. The determination of the total energy of a state can still be made from knowledge of the spatial metric at a given time. The self-mass of a particle is then the total energy of a pure one-particle state, i.e., a state containing no excitations of the canonical variables of the Maxwell or Einstein fields. Solutions corresponding to pure particle states of two like charges are also obtained, and their energy is shown consistent with the one-particle results. (Author)

AD-613 320 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Universidad Nacional de Cuyo, San Carlos de Bariloche (Argentina). Instituto de Fisica.
THE MECHANISM OF WORK-HARDENING IN F.C.C SINGLE CRYSTALS,
by Gunther Schoeck. Feb 65, 13p
Grant DA ARO49 092 64G27
Unclassified report

Descriptors: (*Single crystals, Hardness), Deformation, Crystal lattice defects, Stresses, Hardening, Crystal growth, Controlled atmospheres, Aluminum, Copper, Shear stresses.

At room temperature the stress to deform crystals with edge orientation is higher than the stress to deform crystals with screw orientation. This is probably not on effect due to the blocking of slip lines on the surface by an oxide layer since screw dislocations should find less resistance to penetrate the surface. Aluminum crystals grown in argon atmosphere have a lower critical resolved shear stress than crystals grown in air. (Author)

AD-613 321 Div. 25
CFSTI Prices: HC$4.00 MF$1.00

Air Force Cambridge Research Labs., Bedford, Mass.
STUDY OF FERRIMAGNETIC CRYSTALS BY PARALLEL PUMPING.
Scientific rept.,
by James C. Sethares and Frank A. Olson. Jan 65,
130p Special rept. no. SR-19, AFCRL 65-64
Proj. 5635, Task 5635 03
Unclassified report

Descriptors: (*Ferromagnetic crystals, Pumping (Electronics)), (*Pumping (Electronics), Ferromagnetic crystals), Single crystals, X band, K band, Yttrium compounds, Iron compounds, Garnet, Microwaves, Ferromagnetism, Phonons.

A study of single-crystal ferrimagnetic crystals at microwave frequencies was conducted. The parallel-pumping technique was used to experimentally measure spin-wave linewidth, magnetoelastic coupling constants, energy exchange constants, and phonon linewidths. The experiments were carried out at 300K, 194K, 77K, and 4.2K at X- and K-band frequencies. Four samples of pure, single-crystal yttrium iron garnet (one disk, and three spheres) were extensively investigated. Conditions for optimum detection sensitivity of spin-wave instability measurement are given and discussed. The theory of parallel pumping is explained and worked out in detail. Expressions are obtained for spin-wave and phonon linewidths, magnetoelastic constants and exchange constants in terms of experimentally measured quantities. A literature search was made for publications dealing with parallel-pumping phenomena. These articles (over 75) are abstracted for their contents relative to this investigation. (Author)

AD-613 340 Div. 25, 4, 14, 30
CFSTI Prices: HC$4.00 MF$0.75

Naval Ordnance Lab., Corona, Calif.

FOUNDATIONAL RESEARCH PROJECTS.
Quarterly rept. for Oct-Dec 64.
1 Mar 65, 113p
Task R360FR104 211 1R011 01 01,
RRMA03 016 211 1R007 03 01.
NAVWEPS 8226

Unclassified report

See also AD-601 192.

Descriptors: (*Ferromagnetism, Naval research), (*Heat-resistant plastics, Naval research), (*Lasers, Naval research), (*Semiconductors, Naval research), (*Spectroscopy, Naval research), Magneto-optic effect, Phosphonitrile chlorides, Glycols, Phosphines, Light, Perturbation theory, Lanthanum compounds, Chlorides, Promethium, Fluorescence, Neodymium, Atomic energy levels.

Contents: Observation of magnetic domains by means of HeNe laser light, by J. L. Tomlinson; Synthesis of a cyclic hexaphenyldichlorophosphonitrile tetramer and its reaction with diols, by D. L. Herring and C. M. Douglas; Coupling reactions between hexaphenyldiazidocyclophosphonitrile and selected bis-tertiary phosphines, by A. J. Bilbo and C. M. Sharts; Partially coherent light from incoherent sources, by T. Hadeishi; Covariant form of the gyration vector of an insulating crystal for frequencies close to the gap frequency, by A. Nedoluha; Improved technique for the measurement of the rotation of the plane of polarization, by C. J. Gabriel, V. A. Patton, and H. Piller; Plasma and spin resonance in semiconductors, measured with the Varian V-4500 EPR spectrometer, by G. Zaeschmar; Fluorescence spectrum of Pr3+ in LaF3, by H. E. Rast and R. A. Buchanan; Intermediate coupling energy levels for Nd3+(4f3) in LaF3, by H. H. Caspers, H. E. Rast, and R. A. Buchanan.

AD-613 341 Div. 25, 15
CFSTI Prices: HC$3.00 MF$0.75

Lincoln Lab., Mass. Inst. of Tech., Lexington.
COMPUTATIONALLY FEASIBLE FREQUENCY ESTIMATES IN THE PRESENCE OF UNKNOWN PHASE AND AMPLITUDE,
by L. A. Gardner, Jr. 11 Mar 65, 75p
Technical note 1965-4
Contract AF19 628 500
ESD TDR-65-58

Unclassified report

Descriptors: (*Frequency, Measurement), (*Functions, Frequency), (*Trigonometry, Functions), Numerical analysis, Least squares method, Stochastic processes, Statistical processes, Signal-to-noise ratio, Integral transforms, Analysis of variance, Atmosphere entry.

The problem of estimating the angular frequency in a single trigonometric regression function, observed in the presence of correlated noise, can be approached by the method of Least Squares or procedures based on the theory of empirical spectral analysis. For real time applications, such methods generally are prohibitively time consuming. Two simple and consistent frequency estimates are introduced which use at most the first three sample covariances, and derive and compare their large sample distributions. A by-product of the calculations is a precise analysis of the asymptotic behavior of the (inconsistent) technique known in numerical analysis as Prony's method. (Author)

AD-613 343 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

California Univ., La Jolla.
CONTINUITY BETWEEN BOUND AND UNBOUND STATES IN A FERMI GAS,
by W. Kohn and C. Majumdar. 3 Feb 65, 20p
Technical rept. no. TR-28
Contract Nonr221611, Proj. NR017 630

Unclassified report

Descriptors: (*Gases, Fermions), (*Fermions, Gases), (*Potential theory, Gases), Functions, Phase studies, Metals, Continuum mechanics.

A soluble model of a gas of independent Fermions in the presence of an attractive localized potential is considered. It is shown that the properties of the system as a whole are smooth (analytic) functions of lambda, even at those values of lambda where new single particle bound states appear. Thus for the system as a whole, the transition from 'screening' to 'binding' is smooth and the concept of a bound state cannot be given a sharp meaning. Implications for certain metals and alloys are discussed. (Author)

AD-613 346 Div. 25, 7
CFSTI Prices: HC$1.00 MF$0.50

PEK Labs., Inc., Sunnyvale, Calif.
LASER FLASH LAMP.
Semi-Annual technical summary rept. for 30 Nov 63-1 Jun 64,
by C. H. Keller, J. P. Moffat, and G. O. Harding.
1 Jun 64, 18p
Contract NONR412200, Proj. NR012 502

Unclassified report

Descriptors: (*Lasers, Pumping (Electronics)), (*Pumping (Electronics), Lasers), (*Flash lamps, Pumping (Electronics)), Light, Production, Optics, Absorption, Measurement.

Flash lamps for pumping laser rods can be made in a variety of forms and operated under widely varying electrical circuit conditions. It is the object of this study to attempt to optimize some of the variables: Two avenues of approach are pursued, one being on opacity measurement to discover what gains in principle are to be gotten by doping, and the other a series of trials in which lamps of sturdier than usual structure are tested to their destructive limit. These avenues are discussed separately under the headings, 'Absorption Measurements' and 'Claesson-Type Lamps'.

AD-613 351 Div. 25, 15, 30
CFSTI Prices: HC$7.00 MF$2.00

Ventura Div., Northrop Corp., Newbury Park, Calif.
STUDIES OF FINITE DIFFERENCE TECHNIQUES FOR CONTINUUM MECHANICS.
Rept. for 11 Apr 63-12 Apr 64,
by John G. Trulio. Dec 64, 390p
Contract AF29 601 5971, Proj. 5710,
WL TDR-64-72

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
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Descriptors: (*Continuum mechanics, Difference equations), (*Difference equations, Continuum mechanics), Elasticity, Viscosity, Mechanical waves, Numerical methods and procedures, Integration, Differential equations, Bessel functions, Programming (Computers), Strain (Mechanics).

Solutions to hyperbolic equations typically have discontinuous first or second space and time derivatives.

This limits the rate of convergence of time-marching numerical procedures for solving hyperbolic problems. With N zones on a finite one-dimensional region of space, the truncation error tends to zero no faster than N-3/2 for large N. Truncation error estimates based on Taylor's Series expansions are usually incorrect. The truncation error can be decreased by using higher-order differences if the equations are written in characteristic coordinates. These conclusions are reached by solving finite difference equations analytically, e.g., the Richtmyer-von Neumann equations are solved with infinitesimal time-step for a pulse in an elastic medium. Supporting numerical results are shown. Artificial viscosities--particularly linear viscosities--significantly degrade pulses in elastic media. Numerical results are given for various viscosity coefficients. A procedure is given for uniquely determining finite strain in finite zones of material.

AD-613 375 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Georgetown Univ., Washington, D. C.
A THEORETICAL STUDY OF THE VIBRATIONAL ENERGY LEVELS OF DIATOMIC MOLECULES.
Final technical rept. for Jan 60-Jun 62,
by Charles L. Beckel. Jun 62, 7p
Grant AF AFOSR60 1
AFOSR 3031

Unclassified report

Descriptors: (*Diatomic molecules, Atomic energy levels), (*Atomic energy levels, Diatomic molecules), Vibration, Ions.

A summary of research on vibrational energy levels in diatomic molecules is presented, along with a list of completed theses and papers either presented at scientific meetings or published in scientific journals.

AD-613 381 Div. 25

California Univ., Berkeley.
ANTIFERROMAGNETIC RESONANCE IN FeF2 AT FAR-INFRARED FREQUENCIES,
by Robert C. Ohlmann and M. Tinkham.
13 Mar 61, 10p

Unclassified report

Pub. in Physical Review (U. S.) v123 n2 p425-34 Jul 15 1961 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF, Alfred P. Sloan Foundation, and ONR.

Descriptors: (*Antiferromagnetism, Resonance), (*Iron compounds, Fluorides), (*Infrared phenomena, Antiferromagnetism), Single crystals, Cryogenics, Anisotropy, Line spectrum, Nuclear spins, Atomic orbitals, Hamiltonian, Field theory, Magnetic fields, Crystal lattices, Paramagnetic resonance.

Antiferromagnetic resonance in single crystals of FeF2 was observed between 1.5 and 66K in the far-infrared region. The resonance frequency at T approx. =O was found to be 52.7±0.2/cm. Using the antiferromagnetic resonances relation derived by Kittel, Nagamiya, Keffer, and others, and using the experimental value for the static susceptibility, the uniaxial anisotropy constant at absolute zero, K(O), was inferred to be 1.1x10 to ergs/cu. cm (40/cm/atom). Measurements of the splitting of the line caused by an external magnetic field gave 2.25±0.05. The anisotropy energy in FeF2, being primarily due to the crystalline field-spin-orbit interaction, may be described by a term Sigma-; DS-zi sq. in the Hamiltonian. By including this interaction in the molecular-field treatment, it was determined that D= -9±2/cm, and calculation was made of the temperature dependences of the sublattice magnetization, the anisotropy constant, the resonance frequency, and the line width. The last two were compared with the experimental results and found to be in reasonable agreement. The line-widths were found to follow a T(4) law above 15K. The search over a frequency region of 13-70/cm for the absorption lines expected in the paramagnetic region was unsuccessful, possibly indicating a relaxation time of less than 10 to the -12 power sec. (Author)

AD-613 382 Div. 25

California Univ., Berkeley.
DEPENDENCE OF THE ENERGY GAP IN SUPERCONDUCTORS ON POSITION AND MAGNETIC FIELD,
by M. Tinkham. 15 Jun 61, 7p

Unclassified report

Pub. in IBM Journal of Research and Development (U. S.) v6 n1 p49-54 Jan 1962 (Copies not available to DDC or Clearinghouse customers).
Supported in part by ONR, NSF and Alfred P. Sloan Foundation.

Descriptors: (*Superconductors, Atomic energy levels), (*Films, Superconductivity), Magnetic properties, Thermal conductivity, Absorption spectrum, Microwave spectroscopy, Measurement, Phase studies, Indium, Theory, Solid state physics.

A review is given of work concerning the decrease of the energy gap in superconductors when a magnetic field is applied. The absence of any observable effect in previous spectroscopic work is explained, and conditions for large effects are outlined. Experimental measurements on thermal conductivity and microwave absorption in films in a magnetic field are described. The results show that in thin films, the gap can be depressed continuously to zero, yielding a second-order phase transition. In thicker films, the gap can be only partially depressed before the transition, and the transition is of first order. These results agree with those obtained theoretically by Douglass from the Ginzburg-Landau-Gor'kov theory, and experimentally, by electron tunnelling. An attempt to generalize the Ginzburg-Landau-Gor'kov theory to cope with the case when epsilon sub o/kT> I is then indicated. (Author)

AD-613 388 Div. 25, 8

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
BEAM-PLASMA DISCHARGE: BUILDUP OF OSCILLATIONS,
by W. D. Getty and L. D. Smullin. 2 May 63, 9p
Grant NSF G9330

Unclassified report

Pub. in Journal of Applied Physics (U. S.) v34 n12 p3421-9 Dec 1963 (Copies not available to DDC or Clearinghouse customers).
Supported in part by U. S. Army Signal Corps, AFOSR, ONR.

Descriptors: (*Plasma oscillations, Electron beams), (*Electron beams, Plasma oscillations), (*Electric discharges, Plasma medium), Excitation, Electrons, Radiofrequency generators, Transients, Cyclotron resonance phenomena.

Plasma electron heating was accomplished by exciting plasma oscillations with a pulsed, 10-kV, 1-A electron beam drifting in a longitudinal magnetic field of 100 to 1000 Oe. The oscillatory energy gained by plasma

electrons leads to an increase in their density and mean kinetic energy. The resulting plasma, which is called the 'beam-plasma discharge,' is an rf discharge in which a beam-plasma interaction generates the rf fields. At the beginning of a beam pulse, beam electrons generate a plasma by ionization of the background gas. Within a few microseconds excited plasma electrons become the dominant ionization source. The transient rf oscillations that appear in the first few microseconds of the beam pulse are described. From a detailed study of this transient it was concluded that a nonconvective instability initiates the oscillations, which first appear at the electron cyclotron frequency, and that a convective instability at the plasma frequency generates the oscillations that sustain the discharge. (Author)

AD-613 393 Div. 25

Rochester Univ., N. Y.
INFRARED ABSORPTION SPECTRA OF SODIUM SILICATE GLASSES FROM 4 TO 30 MICRONS,
Revised ed.,
by Rinoud Hanna and G-J. SU. 22 May 64, 5p
Contract Nonr68819

Unclassified report

Pub. in American Ceramic Society. Journal (U. S.) v47 n12 p597-601 Dec 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of rept. dated 27 Dec 63.

Descriptors: (*Sodium compounds, Silicates), (*Glass, Spectra (Infrared)), (*Spectra (Infrared), Glass), (*Silicates, Glass), Absorption spectrum, Infrared radiation, Quartz, Band spectrum.

The infrared absorption spectra of sodium silicate glasses of molar composition Na2O.xSiO2 (where x = 5, 4,3, and 2) were determined with unpolarized radiation in the 4 to 30 micron region. The glass spectra showed a definite similarity to the spectra of alpha-quartz, with lattice vibrational bands around 1066, 786, and 464/cm. As x decreased, some bands shifted toward lower frequencies indicating a decrease in the force constant. No new frequencies were found in the silicate glasses which did not have counterparts in alpha-quartz. (Author)

AD-613 395 Div. 25

Illinois Univ., Urbana. Dept. of Physics.
ACOUSTIC IMPEDANCE OF LIQUID He3,
by J. Gavoret. 13 Aug 64, 3p
Grant DA ARO D31 124G340
AROD 431:64

Unclassified report

Pub. in Physical Review (U. S.) v137 n3A pA721-3 Feb 1 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Acoustic impedance, Helium), (*Helium, Liquefied gases), Cryogenics, Vibration, Kinetic theory, Transport properties.

A derivation is presented of the acoustic impedance of liquid He3 at very low temperatures, where the behavior of the liquid is of the collisionless type. Assuming the collective mode is dominant, the energy transfer at the boundary can be calculated directly by equating the work done by the vibrating wall against the pressure of the liquid to the energy flowing from the wall in the collective mode. The comparison of results with the exact result obtained by Bekarevich and Khalatnikov demonstrates the accuracy of the method. The application to experiment is discussed. (Author)

AD-613 397 Div. 25

Texas Univ., Austin.
FLUCTUATIONS OF ELECTRODELESS RING DISCHARGES IN STATIC MAGNETIC FIELDS,
by C. J. Ransom and H. Schluter. 27 Nov 64, 2p
AROD 4159:1

Unclassified report

Pub. in Physics Letters (Netherlands) v13 n4 p313-4 Dec 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Plasma medium, Transport properties), (*Electric discharges, Plasma physics), Plasma oscillations, Magnetic fields, Gas discharges, Hydrogen, Deuterium, Helium, Electric fields, Radiofrequency.

Evidence is presented for enhanced losses and fluctuating behavior of plasma particles in the case of a powerful electrodless R.F ring discharge without the presence of a D.C. discharge current.

AD-613 398 Div. 25

California Univ., Berkeley.
FAR-INFRARED ENERGY GAP MEASUREMENTS IN BULK SUPERCONDUCTING IN, Sn, Hg, Ta, V, Pb, AND Nb,
by P. L. Richards and M. Tinkham. 17 Feb 60, 16p

Unclassified report

Pub. in Physical Review (U. S.) v119 n2 p575-90 Jul 15 1960 (Copies not available to DDC or Clearinhouse customers)
Supported in part by NSF, Alfred P. Sloan Foundation, and ONR.

Descriptors: (*Superconductors, Quantum mechanics), Indium, Tin, Mercury, Tantalum, Vanadium, Lead, Niobium, Superconductivity, Atomic energy levels, Electron transitions, Excitation, Energy, Measurement, Infrared optical systems, Solid state physics.

Measurements of the onset of absorption due to excitation of electrons across the energy gap were made on a variety of superconductors. Using the onset of the main absorption edge as a measure of the energy gap, the values of E sub g(0), the energy gap at absolute zero, were found to be 4.1±0.2 kT sub c for indium, 3.6±0.2 kT sub c for tin, 4.6±0.2 kT sub c for mercury, Lor =3.0 kT for tantalum, 3.4±0.2 Kt sub c for vanadium, 4.1±0.2 kT sub c for lead, and 2.8±0.3 kT sub c for niobium. The deviations of these values of the energy gap from the Bardeen-Cooper-Schrieffer value of 3.5 kT sub c are a fairly smooth function of the Debye temperature alone, but a less smooth one of the ration of the Debye temperature to the critical temperature. Structure was found on the absorption curves of lead and mercury. Its interpretation is discussed in terms of possible states in the gap, anisotropy of the gap, and of a possible dielectric anomaly. The position of the main absorption edge seemed to scale with temperature according to the temperature dependence of the energy gap predicted by the Bardeen-Cooper-Schrieffer theory, and the structure appeared to have a roughly similar temperature dependence. The absorption curves for pure super-conductors are compared with predictions based on the theory of the skin effect in the normal and superconducting states. (Author)

AD-613 399 Div. 25

California Univ., Berkeley.
FAR-INFRARED EXCHANGE RESONANCE IN YTTERBIUM IRON GARNET,

by A. J. Sievers, III and M. Tinkham. 15 Jun 61, 5p
Unclassified report

Pub. in Physical Review (U. S.) v124 n2 p321-5 Oct 15 1961 (Copies not available to DDC or Clearinghouse customers)
Supported in part by ONR, NSF, and Alfred P. Sloan Foundation.

Descriptors: (*Garnet, Ferromagnetism), (*Nuclear magnetic resonance, Garnet), Cryogenics, Ytterbium compounds, Iron compounds, Infrared radiation, Wave transmission, Single crystals, Crystal substructure, Absorption, Measurement.

An exchange resonance has been observed in a pressed powder sample of ytterbium iron garnet at 14.1±0.2/cm at 2K. The temperature dependences of the resonance frequency and absorption strength were measured from 2K to 66K. The resonant frequency at all temperatures is in good agreement with the two-sublattice theory when the appropriate spectroscopic g value (3gj) is used and when the anisotropy energy is taken into account at low temperatures. The two-sublattice model also reproduces the measured absorption strength to within a factor of two, and its temperature dependence even more precisely. Two other magnetic absorptions with temperature-independent frequencies were observed at 23.4±0.3/cm and 26.4±0.3/cm. At 30K, an 11-koe field on a single crystal was found to vary the frequency and intensity of these lines, which arise from the exchange splittings of the ytterbium ground-state doublet. The contribution via dispersion theory of the infrared absorption lines to the static susceptibility at 2K is in good accord with the dc value measured by Psuthenet. This agreement suggests that all major contributions to the static susceptibility have been measured. (Author)

AD-613 400 Div. 25

California Univ., Berkeley.
FAR-INFRARED FERROELECTRIC VIBRATION MODE IN SrTiO3,
by A. S. Barker, Jr. and M. Tinkham. 30 Oct 61, 4p
Unclassified report

Pub. in Physical Review (U. S.) v125 n5 p1527-30 Mar 1 1962 (Copies not available to DDC or Clearinghouse customers). Supported in part by ONR, NSF, and Alfred P. Sloan Foundation.

Descriptors: (*Strontium compounds, Titanates), (*Titanates, Dielectric properties), Ferroelectric crystals, Ferroelectricity, Spectra (Infrared), Low frequency.

The real and imaginary parts of the dielectric constant of SrTiO3 have been obtained for the region 2.5 to 3000/cm from an analysis of the reflectivity. The imaginary part exhibits a very strong peak at 100/cm at room temperature which shifts to 40/cm at 93 degrees K. This mode is of sufficient strength to account for more than 90% of the low-frequency dielectric constant. The accompanying dispersion of the real part of the dielectric constant is of resonant form. The connection of this mode with Cochran's theory of ferroelectricity is discussed. (Author)

AD-613 401 Div. 25, 14

California Univ., Berkeley.
FAR INFRARED SPECTRA OF MAGNETIC MATERIALS,
by M. Tinkham. 1962, 6p
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n3 suppl p1248-53 Mar 1962 (Copies not available to DDC or Clearinghouse Customers)
Supported in part by ONR, NSF, and Alfred P. Sloan Foundation.

Descriptors: (*Magnetic materials, Spectra (Infrared)), (*Infrared spectroscopy, Magnetic materials), Rare earth compounds, Iron compounds, Garnet, Antiferromagnetism, Magnetic resonance, Fluorides, Manganese compounds, Nickel compounds, Oxides, Ferromagnetic materials.

The far infrared spectral region (approximately 10-100 cm) corresponds to kT for T = 15-150K or beta H for H = 100,000-1,000,000 oe. Materials with characteristic temperatures or fields of these orders of magnitude may have interesting far infrared spectra. A study was made of far infrared resonance spectra in antiferromagnetic and in ferromagnetic rare-earth iron garnets.

AD-613 402 Div. 25

California Univ., Berkeley.
FAR INFRARED TRANSMISSION THROUGH SUPERCONDUCTING FILMS,
by D. M. Ginsberg and M. Tinkham. 30 Dec 59, 11p
Unclassified report

Pub. in Physical Review (U. S.) v118 n4 p990-1000 May 15 1960 (Copies not available to DDC or Clearinghouse customers)
Supported in part by the A. P. Sloan Foundation, NSF, and ONR.

Descriptors: (*Films, Superconductors), (*Superconductors, Infrared radiation), (*Infrared radiation, Superconductors), Wave transmission, Lead, Tin, Indium, Mercury, Conductivity, Magnetic fields, Electromagnetic properties, Electrical conductance.

The far infrared transmission through films of superconducting and normal lead, tin, indium, and mercury has been measured in the wavelength region between 0.1 and 1.1 mm. The transmission data have been analyzed to find the ratio of the complex conductivity in the superconducting state to that in the normal state, as a function of frequency. The width of the energy gap at 0 degrees K may be estimated from the frequency of the extrapolated cutoff of the real part of the superconducting conductivity. The values so obtained are 4.0±0.5, 3.3±0.2, and 3.9 ±0.3kT sub c for lead, tin, and indium, respectively. These values are in good agreement with those obtained in other experiments on bulk samples. It has also been found that a magnetic field as high as 8000 gauss applied in the plane of a lead film about 12 A thick has only a very small effect on the electromagnetic properties of the film.

AD-613 405 Div. 25

California Univ., Berkeley.
INFRARED ANTIFERROMAGNETIC RESONANCE IN MnO,
by F. Keffer, A. J. Sievers, III, and M. Tinkham. 1961, 2p
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v32 n3 p65S-6 Mar 1961 (Copies not available to DDC or Clearinghouse customers).
Supported in part by A. P. Sloan Foundation, NSF, ONR, and Union Carbide Corp.

Descriptors: (*Manganese compounds, Antiferromagnetism), (*Antiferromagnetism, Manganese compounds), (*Oxides, Manganese compounds), Nuclear resonance, Anisotropy, Resonance absorption, Nuclear spins, Powders, Brillouin zones.

Antiferromagnetic resonance has been observed in powdered MnO at 364 microns at 1.5 degrees K. The resonance frequency as a function of temperature falls roughly as the square root of the Brillouin function of spin 5/2. Fields of the order of 10 to the 4th power oe have no observable effect on the line at 1.5 K. All of these results give quantitative confirmation of a model in which the sublattice magnetizations are constrained to a (111) plane by magnetic dipolar interactions and are held to a preferred direction within the plane by a much weaker anisotropy. (Author)

AD-613 412 Div. 25, 15

Duke Univ., Durham, N. C.
THE GENERALISATION OF THE WIGNER-RACAH ANGULAR MOMENTUM CALCULUS,
by L. C. Biedenharn. 26 Dec 62, 3p
Unclassified report

Pub. in Physics Letters (Netherlands) v3 n5 p254-5 Jan 15 1963 (Copies not available to DDC or Clearinghouse customers)
Supported in part by ARO(D) and NSF.

Descriptors: (*Momentum, Operators (Mathematics)), (*Operators (Mathematics), Momentum), Perturbation theory, Groups (Mathematics), Quantum mechanics, Calculus of variations.

AD-613 413 Div. 25, 15, 20

Duke Univ., Durham, N. C.
INVARIANT OPERATORS OF THE CASIMIR TYPE,
by L. C. Biedenharn. 5 Nov 62, 2p
Unclassified report

Pub. in Physics Letters (Netherlands) v3 n2 p69-70 Dec 1 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Operators (Mathematics), Invariance), (*Groups (Mathematics), Nuclear spectroscopy), Quantum statistics, Elementary particles.

AD-613 414 Div. 25, 20

Duke Univ., Durham, N. C.
A NOTE ON PROPER ANGULAR MOMENTUM VARIABLES AND THE IMPLICATION FOR ANGULAR CORRELATION THEORY,
by L. C. Biedenharn and P. J. Brussaard. 5 Jun 61, 14p
Unclassified report

Pub. in Annals of Physics (U. S.) v16 n1 p1-13 Oct 1961 (Copies not available to DDC or Clearinghouse customers).
Supported in part by AEC and ARO(D).

Descriptors: (*Momentum, Quantum mechanics), (*Correlation techniques, Momentum), Statistical mechanics, Nuclear reactions, Field theory, Projective geometry, Euler's angles.

Although angular momentum theory in quantum mechanics has been extensively investigated, the uncertainty relations for the angular momentum variables seem not to have been considered in equal detail, and the present work is addressed to this problem. As an application, it is shown that the factorization of the angular correlation coefficients in the Legendre expansion for a two-step nuclear reaction involving a pure intermediate state, is a direct consequence of the uncertainty relations. (Author)

AD-613 416 Div. 25

Carnegie Inst. of Tech., Pittsburgh, Pa.
EFFECTS OF A MAGNETIC FIELD ON HEAT CONDUCTION IN SOME FERRIMAGNETIC CRYSTALS,
by D. Douthett and S. A. Friedberg. 10 Nov 60, 8p
Unclassified report

Pub. in Physical Review (U. S.) v121 n6 p1662-7 Mar 15 1961 (Copies not available to DDC or Clearinghouse customers)
Supported in part by NSF, ONR, and Alfred P. Sloan Foundation.

Descriptors: (*Ferrites, Magnetic properties), (*Thermal conductivity, Ferrites), (*Ferromagnetic materials, Thermal conductivity), Cryogenics, Manganese compounds, Cobalt compounds, Zinc compounds, Crystals, Phonouns.

The thermal conductivities of single-crystal bars of several ferrites have been measured over the temperature range of 1.4 to 25 K in both zero external magnetic field and in a field of about 9.4 kilo-oersteds. For each specimen the zero-field conductivity is a smooth function of the temperature over the entire range considered. The magnitudes of the conductivities of the manganese and cobalt-zinc ferrite specimens are quite low, approximately 1.5 mw/cm-K at 4 K. Upon application of a magnetic field parallel to the direction of heat current flow, the conductivities of the manganese ferrite and cobalt-zinc ferrite specimens are increased. The magnetoconductivities are rather large. For example, Delta K/K sub o = 0.2 for manganese ferrite at 2 K. Such a field produces no detectable change in the conductivity of the manganese-zinc ferrite. The experimental results are interpreted on the basis of the assumption that the heat current is primarily a phonon current limited by phonon-magnon scattering. (Author)

AD-613 417 Div. 25

Carnegie Inst. of Tech., Pittsburgh, Pa.
LOW-TEMPERATURE MAGNETIC SUSCEPTIBILITIES OF THE HYDRATED ACETATES OF Ni(++), Co(++), AND Mn(++),
by R. B. Flippen and S. A. Friedberg.
9 Aug 60, 10p
Unclassified report

Pub. in Physical Review (U. S.) v121 n6 p1591-8 Mar 15 1961 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR, NSF, and Alfred P. Sloan Foundation.

Descriptors: (*Metatorganic compounds, Magnetic properties), (*Acetates, Hydrates), Nickel compounds, Cobalt compounds, Manganese compounds, Low-temperature research, Powders.

The magnetic susceptibilities of powdered Ni(C2H3O2)2.4(H2O), Co(C2H3O2)2.4(H2O), and Mn(C2H3O2)2.4(H2O) have been measured in the liquid hydrogen and helium ranges by an ac mutual inductance method. Measurements on the cobalt salt were extended to 0.4K revealing a sharp maximum at 0.6K. A similar, more pronounced susceptibility peak is observed in the manganous acetate at 3.2K. Single crystal measurements have been made on the latter salt along the monoclinic b axis as well as in the ac plane. Mn(C2H3O2)2.4(H2O) appears to be a weak ferromagnet of the kind discussed recently by Dzyaloshinsky and Moriya. (Author)

AD-613 418 Div. 25

Harvard Univ., Cambridge, Mass.
ATOMIC BEAM RESONANCE EXPERIMENTS WITH STORED BEAMS,
by H. Mark Goldenberg, Daniel Kleppner, and Norman F. Ramsey. 13 Mar 61, 8p
Unclassified report

Pub. in Physical Review (U. S.) v123 n2 p530-7 Jul 15, 1961 (Copies not available to DDC or Clearinghouse customers) Supported by The Signal Corps, NSF, and ONR.

Descriptors: (*Particle beams, Cesium), (*Resonance, Particle beams), (*Hyperfine structure, Cesium), Perturbation theory, Masers, Surface properties, Hydrocarbons.

The atomic-beam separated, oscillatory-field resonance technique has been used to study the hyperfine frequency of cesium which is perturbed by collisions with storage box walls. With a wall coating of long straight-chain saturated hydrocarbons, resonances are observed after as many as 200 wall collisions. A theory of the effect of wall collisions on the hyperfine frequency which is in qualitative agreement with experimental results is described. The shape of the resonance curve is analyzed by a detailed consideration of the statistical nature of the wall collision. (Author)

AD-613 419 Div. 25

Harvard Univ., Cambridge, Mass.
PROTON RADIO-FREQUENCY SPECTRUM OF HCl(35),
by John A. Leavitt, Milton R. Baker, H. Mark Nelson, and Norman F. Ramsey. 28 Jul 61, 5p
Unclassified report

Pub. in Physical Review (U. S.) v124 n5 p1482-6 Dec 1 1961(Copies not available to DDC or Clearinghouse customers).
Supported in part by NSF, ONR, and AEC.

Descriptors: (*Hydrochloric acid, Radiofrequency spectroscopy), (*Radiofrequency spectroscopy, Hydrochloric acid), (*Protons, Radiofrequency spectroscopy), Molecular beams, Magnetic resonance, Magnetic moments, Nuclear spins, Hamiltonian, Chlorine, Isotopes, Gases.

The radio-frequency spectrum corresponding to reorientation of the proton magnetic moment in HCl(35) in the presence of an external magnetic field has been obtained using the molecular beam magnetic resonance method. The value of the spin rotational constant of the proton in HCl(35) has been determined to be 41±3 kc/sec. An approximate theory of the proton spectrum has been developed to aid in the analysis of the experimental data. Theoretical spectra were calculated on the UNIVAC computer using this approximate theory and directly compared with the experimental spectrum to estimate the value of the spin rotational constant. Theoretical spectra were also calculated on the UNIVAC using a direct solution of the Hamiltonian secular equation and were compared with the experimental curves to provide a check on the validity of the approximate theory. The comparisons indicate that the use of the approximate theory will allow the determination of the spin rotational constant to within 10%.

AD-613 420 Div. 25

Harvard Univ., Cambridge, Mass.
PROPERTIES OF THE HYDROGEN MASER,
by Daniel Kleppner, H. Mark Goldenberg, and Norman F. Ramsey. Jul 61, 6p
Unclassified report

Pub. in Applied Optics (U. S.) v1 n1 p55-60 Jan 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by ONR and NSF.

Descriptors: (*Masers, Hydrogen), (*Hydrogen, Masers), Hyperfine structure, Ground state, Cesium, Isotopes, Doppler effects.

Properties of the hydrogen maser and details of the apparatus are discussed. Experimental work is described which yields a new value for the hyperfine separation of hydrogen in its ground state. The result is 1,420,405,762 ± cps. This result is based on a value of the hyperfine separation in Cs(133) which is taken to be 9,192,631,840 cps. (Author)

AD-613 422 Div. 25

Cornell Univ., Ithaca, N.Y.
MAGNETIC-RESONANCE STUDIES OF LITHIUM VANADIUM BRONZE,
by Julien Gendell, R. M. Cotts, and M. J. Sienko.
22 Jan 62, 6p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v37 n2 p220-5 Jul 15 1962(Copies not available to DDC or Clearinghouse customers).
Supported by AFOSR, NSF, and ARPA.

Descriptors: (*Lithium compounds, Magnetic resonance), (*Vanadium compounds, Oxides), Nuclear magnetic resonance, Temperature, Ions, Crystal lattices, Relaxation time, Transport properties.

The nuclear magnetic resonance of Li7 in Li(x)V2O5 shows no Knight shift, but there is a small diamagnetic shift relative to LiCl solution, amounting to 0.0023 and 0.0058% at 296 and 77K, respectively. The spin-lattice relaxation time T sub 1 as measured by pulse experiments, decreases from 0.16 sec at 296K to a minimum of 0.060 sec at 163K and then rises to 0.13 sec at 77K. The free-induction decay half-width decreases from 850 micro sec at 296K to 100 micro sec at 77K. The minimum in T sub 1 is attributed to back-and-forth motion of the lithium ions within but normal to the axis of channels in the oxygen framework; the line narrowing, to diffusion along the channel from one unit cell to an adjacent one. EPR studies give Lorentzian-shaped lines, centered at g=1.96, of intensity proportional to 1/T. Results are consistent with a model in which lithium atoms in a host V2O5 structure are completely ionized to give Li(+) ions and electrons which are almost, but not completely, localized as V(4+) centers. (Author)

AD-613 424 Div. 25

Columbia Univ., New York.
A BEAM MASER SPECTROMETER,
by Patrick Thaddeus and Lawrence C. Krisher.
22 May 61, 7p
Unclassified report

Pub. in Review of Scientific Instruments (U. S.) v32 n10 p1083-9 Oct 1961(Copies not available to DDC or Clearinghouse customers).
Supported by NSF, ONR, and AFOSR.
See also AD-613 425.

Descriptors: (*Spectrum analyzers, Masers), (*Masers, Spectrum analyzers), (*Ammonia, Masers), Doppler

Effect, Molecular beams, Molecular spectroscopy, Sensitivity, Microwave equipment, Deuterated compounds, Formaldehyde, Heavy water, Hydrogen compounds, Sulfides, Frequency modulation.

The construction and operation of a molecular beam maser spectrometer, similar to the ammonia maser, is described. The observed linewidths are of the order of 5 kc at microwave frequencies, thereby allowing high resolution hyperfine spectroscopy on a number of molecules. The major factors affecting the resolution and sensitivity are examined. A brief survey of possible experiments is given. (Author)

AD-613 425 Div. 25

Columbia Radiation Lab., New York.
HYPERFINE STRUCTURE IN THE MICROWAVE SPECTRUM OF HDO, HDS, HCHO, AND CHDO; BEAM-MASER SPECTROSCOPY ON ASYMMETRIC-TOP MOLECULES,
by P. Thaddeus, L. C. Krisher, and J. H. N. Loubser.
15 Aug 63, 17p

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v40 n2 p257-73 Jan 15 1964 (Copies not available to DDC or Clearinghouse customers).
Supported in part by U. S. Army, ONR, AFOSR, and NSF.
See also AD-613 424.

Descriptors: (*Heavy water, Hyperfine structure), (*Formaldehyde, Hyperfine structure), (*Deuterated compounds, Hyperfine structure), (*Molecular spectroscopy, Masers), Hydrogen compounds, Sulfides, Microwave spectroscopy, Molecular structure, Hamiltonian, Molecular beams, Magnetic resonance, Electric fields.

Hyperfine structure in the 2(20)-2(21) rotational transition of HDO at 10 278.2 Mc/sec and HDS at 11 283.8 Mc/sec, and in the 2(11)-2(12) rotational transition of HCHO at 14 488.6 Mc/sec and CHDO at 16 038.1 Mc/sec, has been investigated with a high-resolution beam maser microwave spectrometer. Linewidths of 5 kc/sec have been obtained. The hyperfine Hamiltonian for an arbitrary number of nuclei with quadrupole, spin-rotation, and spin-spin interactions is discussed, and the matrix elements of the Hamiltonian and the intensities of hyperfine transitions calculated in terms of the tabulated 6j coefficients.

AD-613 426 Div. 25

Hammond Metallurgical Lab., Yale Univ., New Haven, Conn.
MECHANISM FOR DISLOCATION PINNING IN THE ALKALI HALIDES,
by Charles L. Bauer and Robert B. Gordon.
20 Jul 61, 11p

Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n2 p672-82 Feb 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and ONR.

Descriptors: (*Crystal lattice defects, Alkali metal compounds), (*Alkali metal compounds, Halides), X rays, Plasticity, Elasticity, Cryogenics, Low-temperature research, Color centers.

Changes in the elastic modulus and internal friction of plastically deformed rocksalt, caused by changes in the mean free length of oscillating dislocation segments, have been observed during x-irradiation at temperatures ranging from 10 to 300K. The rates at which the modulus and damping changes occur during irradiation are found to be independent of temperature; but during irradiation at helium temperature, the magnitude of the effects is smaller. This decrease in magnitude has been shown to be due to the absence of thermal unpinning. Explanations of the pinning process based on the diffusion of point defects to dislocations appear to be ruled out by the rapidity of the low temperature modulus change. The dislocation pinning produced by irradiation of NaCl, KCl, KBr, and KI at low temperatures is found to be reversible when the crystals are subjected to illumination in, or near, the visible. The wavelength of the illumination which produces the maximum unpinning increases as the lattice constant increases; the effect disappears when the crystals are warmed to room temperature. However, at all temperatures, bleaching a deformed and partially irradiated crystal with F light causes a further modulus increase. The pinning point produced by low temperature irradiation is identified as a dislocation jog in close association with an F center whose absorption band is displaced towards the red by the dislocation strain field. Ionization of the F center results in recombination of its vacancy with the jog; warm-up allows the F center to diffuse beyond recombination range. (Author)

AD-613 427 Div. 25

Hammond Metallurgical Lab., Yale Univ., New Haven, Conn.
STRUCTURE SENSITIVITY OF F-CENTER GENERATION BY X RAYS AT LOW TEMPERATURES,
by Charles L. Bauer and Robert B. Gordon.
17 Nov 61, 6p

Unclassified report

Pub. in Physical Review (U. S.) v126 n1 p73-8 Apr 1 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by NSF and ONR.

Descriptors: (*Color centers, Alkali metal compounds), (*X-rays, Crystallography), (*Radiation damage, Crystal lattice defects), Sodium compounds, Potassium compounds, Chlorides, Single crystals, Solid state physics.

Recent internal friction and elastic modulus experiments suggest that F centers are formed at dislocations in the alkali halides during x irradiation even at liquid helium temperature, but that enhanced colorability is suppressed at low temperatures by the absence of diffusion of the generated centers. In the present experiments F-center growth curves were obtained for both as-received and plastically deformed (up to 15%) NaCl and KCl crystals at temperatures ranging from 10 to 325K. From these data it is found that both the rate of capture of electrons by negative-ion vacancies and the final saturation concentration of F centers achieved are strongly temperature sensitive and that there exists an optimum temperature at which a given color center concentration is attained with a minimum amount of irradiation. The colorability of lightly deformed crystals is found to be enhanced only at temperatures where diffusion of F centers appears to be possible; otherwise a rapid saturation of the coloration is observed. However, the initial F-center growth rate in a heavily deformed crystal, relative to an undeformed one, becomes larger as the temperature is decreased, and can be interpreted in terms of the presence of a larger number of F centers formed near dislocations. With further x irradiation, this additional contribution saturates. (Author)

AD-613 428 Div. 25, 4, 20

Washington Univ., Seattle.
ABSENCE OF A LINEWIDTH TRANSITION FOR THE PROTONS IN KH2PO4-TYPE CRYSTALS,
by J. L. Bjorkstam, E. D. Jones, H. B. Silsbee, and E. A. Uehling. 16 Feb 62, 2p
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v37 n3 p469-70 Aug 1 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by AFOSR and NSF.

Descriptors: (*Protons, Magnetic resonance), (*Magnetic resonance, Protons), (*Crystal lattices, Protons), Low-temperature research, Chemical bonds, Relaxation time, Spin, Magnetic moments, Nuclear spectroscopy.

The linewidth and shape of the proton resonance in KH2PO4 is described, and the nonexistence of a linewidth transition in the range of 77 to 300K is discussed. The calculated and experimental values of the second moment are about 1.5 G squared. (Author)

AD-613 429 Div. 25, 4, 20

Washington Univ., Seattle.
RANDOM MOTION OF DEUTRONS IN KD2P04,
by V. Hugo Schmidt and Edwin A. Uehling.
5 Dec 61, 11p
Unclassified report

Pub. in Physical Review (U. S.) v126 n2 p447-57 Apr 15 1962 (Copies not available to DDC or Clearinghouse customers).
Supported by the AFOSR and NSF.

Descriptors: (*Deuterons, Motion), (*Chemical bonds, Deuterons), (*Crystal structure, Deuterons), Statistical processes, Conductivity, Deuterated compounds, Magnetic resonance, Relaxation time, Ferroelectric crystals, Molecular structure.

Magnetic resonance studies of the deuteron in KD2PO4 have been conducted which show the existence of deuteron jumping between and within hydrogen bonds. The experimental results help to explain electrical conductivity and ferroelectric phenomena in crystals of this type. Pulse magnetic resonance experiments show that the lifetime against deuteron jumping between X- and Y-oriented hydrogen bonds is 15 msec at 70C with a jump activation energy of approximately 0.58 ev. The c-axis electrical conductivity of KD2PO4 is found to have the same activation energy, with a value of 1.16X10 to the -10th power (ohm cm) at 25C. The deuteron spin-lattice relaxation transition probabilities due to X-Y jumps have been calculated from the known values of the lifetime and the electric field gradient tensors at X and Y deuteron sites. Their magnitudes and the dependences of these magnitudes on magnetic field, temperature, and orientation are in good agreement with experiment. Further measurements of P sub 1 and P sub 2 separately give a component of transition probability proportional to exp(0.078 ev/kT) and independent of magnetic field. The orientation dependences of P sub 1 and P sub 2 for this component indicate quadrupolar relaxation due to deuteron jumps along hydrogen bonds, with a jump time of order 10 to the -11th power sec at 215K. The existence of intrabond jumps governed by an activation energy is shown to be consistent with the Slater theory of KH2PO4 as modified by Takagi. (Author)

AD-613 431 Div. 25

Washington Univ., St. Louis, Mo. Dept. of Physics.
RESONANCE ABSORPTION OF GAMMA RAYS IN NORMAL AND SUPERCONDUCTING TIN.
Revised ed.,
by M. Yaqub and C. Hohenemser. 31 May 62, 8p
Unclassified report

Pub. in Physical Review (U. S.) v127 n6 p2028-35 Sep 15 1962 (Copies not available to DDC or Clearinghouse customers).
Supported in part by Air Force and NSF
Revision of rept. dated 7 Aug 61.

Descriptors: (*Tin, Mossbauer effect), (*Superconductors, Tin), Gamma rays, Resonance absorption, Isotopes, Antimony.

A study of the resonant absorption of the 23.8-keV gamma rays in Sn(119) has been made between 373 and 1.1 degrees K by using the Sb(119) K-capture parent. The source was prepared by bombarding natural Sn with 10-MeV deuterons in a cyclotron, and was thick enough to absorb resonantly a large portion of the recoilless photons emitted. By studying the self-absorption in this source between 373 and 60K and taking into account the contributions to the intensity due to resonant scattering, an average value of the Debye temperature theta has been derived. In order to see if the phonon spectrum undergoes a change in passing from the superconducting to the normal phase, the counting rate was measured at several temperatures between 4.2 and 1.1K, with and without a magnetic field strong enough to destroy the superconductivity of the source. Using the derived value of 140K for theta, it was concluded that the change in theta between the two phases could not be more than 0.76K. (Author)

AD-613 432 Div. 25

Pennsylvania State Univ., University Park.
PRECISE MEASUREMENTS OF SOME INFRARED BANDS OF HYDROGEN CHLORIDE,
by D. H. Rank, W. B. Birtley, D. P. Eastman, B. S. Rao, and T. A. Wiggins. 23 Aug 60, 6p
Unclassified report

Pub. in Optical Society of America. Journal (U. S.) v50 n12 p1275-9 Dec 1960 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR and NSF.

Descriptors: (*Hydrochloric acid, Infrared spectroscopy), (*Infrared spectroscopy, Diatomic molecules), (*Deuterated compounds, Infrared spectroscopy), Band spectrum, Measurement, Molecular spectroscopy, Molecular rotation, Vibration.

Precision determinations of the origins of the fundamental and first four harmonic bands of HCl(35) have been made. The rotational constants of the 2-0 and 3-0 bands as well as the origin and rotational constants of the 2-0 band of DCl(35) are also reported. This work will be used in conjunction with additional measurements now in progress on the fundamental band of HCl and other bands of DCl to determine rotation-vibration constants for comparison with theoretical predictions. (Author)

AD-613 433 Div. 25

Pennsylvania State Univ., University Park.
HIGHLY PRECISE WAVELENGTHS IN THE INFRARED. II. HCN, N2O, AND CO,
by D. H. Rank, D. P. Eastman, B. S. Rao, and T. A. Wiggins. 20 Mar 61, 8p
Unclassified report

Pub. in Optical Society of America. Journal (U. S.) v51 n9 p929-36 Sep 1961 (Copies not available to

DDC or Clearinghouse customers)
Supported by ONR and NSF.

Descriptors: (*Infrared spectroscopy, Diffraction gratings), (*Diffraction gratings, Infrared spectroscopy), Infrared optical systems, Synchronization (Electronics), Infrared scanning, Hydrogen compounds, Cyanides, Nitrogen compounds, Carbon compounds, Oxides, Optics.

A discussion is given of the effect of mechanical errors in a grating drive on the accuracy with which line frequencies can be measured. It is shown that it is highly improbable that a mechanical device used to rotate a diffraction grating can be constructed with sufficient precision so that the line-frequency error will be determined by the optical information observable in the near infrared spectrum. By making use of the echelle spectrograph 67 lines of the 001-000 absorption band of HCN have been measuried. Almost 400 lines from five N2O absorption bands arising from the ground state of the molecule have been measured. In addition, 11 lines from the 1-0 fundamental band of CO have been measured in order to determine v sub o for this band. In all cases only band lines have been measured which appear to be free of blends. The molecular constants of the above bands have been determined by making use of the combination relationships applying least-squares methods to the data. The line frequencies have then been calculated to four decimal places and presented in tables. The tables contain over 600 line frequencies. It is believed the calculated line frequencies (lines free of blends) have an absolute accuracy of about 1 part in 5x1,000,000 and a relative accuracy referring to lines within a given band somewhat greater. (Author)

AD-613 434 Div. 25

Pennsylvania State Univ., University Park.
MECHANICAL RESONANCE DISPERSION AND PLASTIC FLOW IN CRYSTALLINE SOLIDS,
by Edwin R. Fitzgerald. 11 Jul 60, 20p
Unclassified report

Pub. in Acoustical Society of America. Journal (U. S.) v32 n10 p1270-89 Oct 1960 (Copies not available to DDC or Clearinghouse customers).
Supported in part by NSF and ONR.

Descriptors: (*Crystals, Creep), (*Creep, Crystals), (*Resonance, Scattering), Solids, Stresses, Shear stresses, Audiofrequency, Deformation, Viscoelasticity, Mechanical properties, Fracture (Mechanics), Brittleness, Polymers, Single crystals, Metals, Quartz, Organic compounds, Sodium compounds, Chlorides, Failure (Mechanics), Germanium, Amino acids.

An explanation is given for the mechanical resonance dispersions observed at audio-frequencies in many crystalline solids. The resonances are considered to result from alternating simultaneous slip occurring on transient slip planes with mean lifetimes of 0.01 to 0.0001 sec. A concept of combined consecutive and simultaneous slip is suggested in which dislocations remain an essential part of the mechanism but are not the sole source of deformation. An interesting consequence of the theory is that a critical stress for plastic flow or, alternatively, for brittle fracture can be predicted from values of the dynamic compliance (or modulus). Predicted values for brittle fracture stress agree almost exactly with observed breaking stresses for single crystals of sodium chloride, germanium, glycine sulfate, and, at two temperatures and orientations, for natural quartz crystals. The occurrence of negative absorption or induced emission is discussed, and a means of generating sustained, self-excited, audio-frequency oscillations in a crystalline solid is outlined. The possibility of mechanical failure at an intrinsic material resonance is considered briefly and some other aspects of the mechanical behavior of crystalline solids are also examined.

AD-613 435 Div. 25

Pennsylvania State Univ., University Park.
ROTATIONAL AND VIBRATIONAL CONSTANTS OF THE HC135 and DC135 MOLECULES,
by D. H. Rank, D. P. Eastman, B. S. Rao, and T. A. Wiggins. 25 May 61, 7p
Unclassified report

Pub. in Optical Society of America. Journal (U. S.) v52 n1 p1-7 Jan 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR and NSF.

Descriptors: (*Hydrochloric acid, Microwave spectroscopy), (*Molecular rotation, Hydrochloric acid), (*Deuterated compounds, Microwave spectroscopy), Diatomic molecules, Vibration, Molecular spectroscopy, Infrared spectroscopy, Molecular properties, Ground state, Algebra.

The 1-0, 2-0, 3-0, 4-0, and 5-0 bands of HC135 and the 1-0 and 2-0 bands of DC135 have been measured with high precision. A critical analysis has been made to determine the rotational and vibrational constants of these molecules. The observed rotational and vibrational constants have been used to calculate the potential constants of HC135 by making use of Dunham's theory of a rotating vibrator. It is shown that HC135 is not a pure rotating vibrator since the observed and calculated values are in disagreement by about 1 part in 1000 which is approximately 10 times the experimental error. By making use of the molecular constants for HC135 and DC135 and the accurately known atomic masses it is deduced that the ground level B sub e is perturbed by the upper electronic levels by 1 part in 8000. The sign of the perturbation is to increase B sub e over its unperturbed value. The sign of the perturbation is such that it may be presumed the HC1 molecule has a positive magnetic moment. It was calculated that mu sub j = +0.2 and +0.1 nuclear magnetons, respectively, for HC135 and DC135. (Author)

AD-613 436 Div. 25, 2

Maryland Univ., College Park.
STARK BROADENING OF NEUTRAL HELIUM LINES IN A PLASMA,
by H. R. Griem, M. Baranger, A. C. Kolb, and G. Oertel. 9 Aug 61, 19p
Unclassified report

Pub. in Physical Review (U. S.) v125 n1 p177-95 Jan 1 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR and NSF.

Descriptors: (*Line spectrum, Helium), (*Plasma medium, Density), Electric fields, Perturbation theory, Ions, Electrons, Selection rules, Fourier analysis, Astrophysics.

The frequency distributions of spectral lines of nonhydrogenic atoms broadened by local fields of both electrons and ions in a plasma are calculated in the classical path approximation. The electron collisions are treated by an impact theory which takes into account deviations from adiabaticity. For the ion effects, the adiabatic approximation can be used to describe the time-dependent wave functions. The various approximations employed were examined for self-consistency,

and an accuracy of about 20% in the resulting line profiles is expected. Good agreement with Wulff's experimental helium line profiles was obtained while there are large deviations from the adiabatic theory, especially for the line shifts. Asymptotic distributions for the line wings are given for astrophysical applications. Here the ion effects can be as important as the electron effects and lead to large asymmetries, but near the line core electrons usually dominate. Numerical results are tabulated for 24 neutral helium lines with principal quantum numbers up to five. (Author)

AD-613 437 Div. 25

Maryland Univ., College Park.
MEASUREMENT OF STARK PROFILES OF NEUTRAL AND IONIZED HELIUM AND HYDROGEN LINES FROM SHOCK-HEATED PLASMAS IN ELECTROMAGNETIC T TUBES,
by H. F. Berg, A. W. Ali, R. Lincke, and H. R. Griem.
9 Aug 61, 8p
Unclassified report

Pub. in Physical Review (U. S.) v125 n1 p199-206 Jan 1 1956 (Copies not available to DDC or Clearinghouse customers)
Supported by ONR and NSF.

Descriptors: (*Line spectrum, Helium), (*Plasma medium, Hydrogen), (*Shock tubes, Plasma medium), Electric fields, Density, Ions, Electrons.

The slab of plasma behind primary or reflected shock fronts served as thermal light source. Electron densities were determined from absolute continuum intensities. Temperatures in helium followed from intensity ratios of ion and neutral lines, or at lower temperatures and in hydrogen from relative line and continuum intensities. Line profiles were measured by scanning with monochromators from shot to shot. Experimental widths and shifts were compared with values calculated from measured electron densities and temperatures. For hydrogen, neutral helium (5876, 5016, 4713, 4471, 3889, 3188A) and ionized helium (4686, 3203A), the widths agree within 10% with theory. He II 4686A exhibits a blue-shift, probably due to the polarization of the plasma near the emitting ions. The measured shifts of the neutral helium lines tend to be smaller than the calculated values, and the agreement with calculated shifts is poorer than in case of the widths. (Author)

AD-613 438 Div. 25, 26

Wisconsin Univ., Madison.
MAPPING OF HIGH-QUALITY OPTICAL FLATS WITHOUT REFLECTION COATING,
by F. L. Roesler. 5 Sep 61, 1p
Unclassified report

Pub. in Optical Society of America. Journal (U. S.) v52 n4 p471 Apr 1962 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF.

Descriptors: (*Optical glass, Precision finishing), (*Precision finishing, Optical glass), Lenses, Surface properties, Mapping, Photographic recording systems, Optics.

A method and apparatus for contour-mapping an uncoated optical plate is discussed. This method could possibly serve as a guide to an optician in his final polishing by showing him where high spots must be removed.

AD-613 442 Div. 25, 15

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THE RELATION BETWEEN THE TRANSPORT AND THE ORBIT MODELS FOR A PLASMA,
by S. Frankenthal and W. P. Allis. 5 Oct 61, 9p
Unclassified report

Pub. in IEEE Transactions on Antennas and Propagation (U. S.) vAP10 n1 p16-23 Jan 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Plasma medium, Mathematical models), (*Integral equations, Plasma medium), (*Particle trajectories, Plasma medium), Field theory, Transport properties.

Starting with the Boltzmann equation and the dynamic equation of a charged particle, a transport (particle) model for the plasma is developed, as well as an orbit (guiding-center) model which is valid for arbitrarily large orbits. The development facilitates the interpretation of the difference between the two models, and sets the stage for the derivation of the conditions under which the two become interchangeable. These conditions include restrictions on the particle distribution and on the field gradients. The role of each model in the formulation of the self-consistent-field problem in the plasma is discussed. (Author)

AD-613 443 Div. 25, 15

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
DYNAMICS OF IONIZED GASES,
by Thomas H. Dupree. 27 Dec 60, 7p
Unclassified report

Pub. in Physics of Fluids (U. S.) v4 n6 p696-702 Jun 1961 (Copies not available to DDC or Clearinghouse customers).
Supported in part by U. S. Army Signal Corps, AFOSR, ONR, and NSF.

Descriptors: (*Magnetohydrodynamics, Partial differential equations), (*Partial differential equations, Magnetohydrodynamics), Gas ionization, Dynamics, Operators (Mathematics), Velocity, Plasma medium, Correlation techniques.

Ionized gas dynamics is discussed in terms of two coupled equations for the one- and two-particle distribution functions. The equations have been obtained previously by multiple integration of the Liouville equation and a formal expansion in the specific volume. The two-particle equation is solved for a multicomponent plasma in terms of two operators which depend on the one-particle functions. It is shown that these operators have a simple interpretation and lend an easy insight into the correlation mechanism. If one neglects the time dependence of the one-particle functions which occur in the operators, then the operators can be obtained explicitly. This procedure is shown to be valid for plasmas with 'smooth' velocity distributions and no large inhomogeneities. When velocity instabilities exist, the correlation function is subject to growing oscillation. The ultimate effect of this instability is not clear. (Author)

AD-613 444 Div. 25, 4

Army Research Office Durham, N. C.
DRIFT MOBILITIES OF HOLES AND ELECTRONS IN NAPHTHALENE,

by M. Silver, J. R. Rho, D. Olness, and R. C. Jarnagin. 8 Apr 63, 2p

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v38 n12 p3030-1 Jun 15 1963 (Copies not available to DDC or Clearinghouse customers)
Supported by NSF and ARPA.

Descriptors: (*Polycyclic compounds, Electrical properties), (*Semiconductors, Polycyclic compounds), Anisotropy, Electrical conductance, Photoelectric effect.

Data are presented on drift mobilities in naphthalene which show that the mobilities of holes in the 'A' direction is smaller than in the 'B' direction, but the anisotropy is not as great as previously predicted.

AD-613 445 Div. 25, 15

Stanford Univ., Calif.
ENERGETIC STABILITY OF PERSISTENT CURRENTS IN A LONG HOLLOW CYLINDER,
by F. Bloch and H. E. Rorschack. 21 Jun 62, 20p

Unclassified report

Pub. in Physical Review (U. S.) v128 n4 p1697-1714 Nov 15 1962 (Copies not available to DDC or Clearinghouse customers).
Supported in part by ONR, AEC, and NSF.

Descriptors: (*Electric currents, Stability), (*Cylindrical bodies, Electric currents), (*Superconductors, Electric currents), Differential equations, Quantum mechanics, Energy, Calculus of variations, Electrons.

An extension is presented of the work of Schafroth in which the carriers of electricity in a superconductor are assumed to constitute an ideal Bose gas. The long-range electromagnetic interactions are fully taken into account by the method of the self-consistent field. The corresponding general equations are obtained from a variational principle applied to the total energy of the system, and the change of the total energy due to individual particle transitions is considered. Axially symmetric solutions are found for the geometry of a long hollow cylinder and for the case in which all particles are in the same lowest single-particle level compatible with the angular momentum l'h around the cylinder axis. This case represents a state of the system in which l' flux quanta are trapped in the cylinder. Assuming the lattice to be at T=0, such a state will be stable against single-particle transitions if the corresponding energy change of the system is positive. This state need not be the state of lowest energy, but it would have a practically infinite lifetime if the stability criterion against single particle transitions is satisfied.

AD-613 446 Div. 25, 2

Western Reserve Univ., Cleveland, Ohio.
INTERNAL STATE OF A GRAVITATING GAS. Revised ed.,
by G. E. Tauber and J. W. Weinberg. 28 Dec 59, 24p

Unclassified report

Pub. in Physical Review (U. S.) v122 n4 p1342-65 May 15 1961 (Copies not available to DDC or Clearinghouse customers)
Supported in part by ONR
Revision of rept. dated 15 Jan 58.

Descriptors: (*Gases, Relativity theory), (*Stars, Relativity theory), (*Kinetic theory, Gases), Equations of state, Statistical mechanics, Center of mass, Mass-energy relation, Fluid mechanics.

The significance of a theory of gravitational equilibrium of concentrated masses is discussed in connection with possible general relativistic effects in white dwarf stars. The covariant form of phase space and Liouville's theorem is developed, using the canonical equations for a particle under gravitational and electromagnetic forces. The dynamical isotropy of the ideal fluid is formulated, and the associated equations of state and allowed streaming patterns are found. A covariant kinetic theory yields general relativistic forms for the Maxwell and Fermi distributions in the case of thermal equilibrium, and limits their streaming to rigid motion. Rotating fluids are studied in comoving coordinates, and the problem of determining their gravitational equilibrium is reduced, in most cases of physical interest, to a simple standard form with constant density and vorticity. (Author)

AD-613 457 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
METHOD OF MEASURING COMPLEX PERMITTIVITY,
by V. S. Panchenko. 30 Mar 65, 6p FTD-TT-65-76 TT 65-61948

Unclassified report

Unedited rough draft trans. of Russian patent 156977, appl. 779217/26-9, 18 May 62.

Descriptors: (*Dielectric properties, Measurement), Electromagnetic waves, Electromagnetic wave reflections, Beams (Electromagnetic), Transmitters-receivers, Patents, USSR.

Object of Invention: A method of measuring complex permittivity (dielectric constant) in a millimeter range of waves based on the measurement of the parameters of a reflected beam of electromagnetic waves directed at some angle to the surface of the specimen being investigated, which is distinguished by the fact that for the purpose of simplifying the process of the measurement and improving its precision, one changes the angle of incidence of the beam of electromagnetic waves on the surface of the specimen, determines the value of pseudo-Brewster angle, and finds the coefficient of reflection at this angle and computes the modulus of the permittivity and the angle of losses. (Author)

AD-613 462 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
EFFECT OF RADIATIVE TRANSFER ON A SOUND WAVE TRAVELING IN GAS HAVING A RATIO OF SPECIFIC HEAT NEAR ONE,
by F. K. Moore. Feb 65, 45p
Rept. no. CAL-AF-1285-A-14
Contract Nonr265300 Unclassified report

Revision of previous rept. 'On the Dispersal of Acoustic Waves by Radiative Transfer of Heat', rept. no. CAL-AF-1285-A-11; AD-437 339.

Descriptors: (*Thermal radiation, Heat transfer), (*Gases, Dissociation), (*Acoustics, Propagation), Differential equations, Pistons, Motion, Temperature, Enthalpy, One-dimensional flow, Specific heat, Conductivity, Boundary layer, Velocity.

It is shown that the assumption of specific heat ratio near one simplifies the analysis of plane sound waves subject to energy addition dependent on temperature, and in the case of radiative energy exchange in a fairly transparent gas, a third-order differential equation is obtained. Analytical solutions for a hot and a cool gas are presented which give the complete history of velocity and temperature profiles when a wave is produced by an impulsively started piston, with either a black or reflecting face. In a very hot gas, an optically thin wave which is thermally dominated by the piston face (or the undisturbed gas, if the face is perfectly reflecting) disperses as though by relaxation and is followed by an optically thick wave which is thermally independent of the piston and disperses as though by conduction. Transition between thin and thick waves is accomplished in a temperature boundary layer. In a cool gas, dispersion occurs as though by simple radiative heat conduction. Dispersion in a transparent gas would be observed on the scale of a meter only if the gas is very hot. (Author)

AD-613 473 Div. 25, 6, 8, 20
CFSTI Prices: HC$2.00 MF$0.50

Martin Co., Orlando, Fla.
EXCITATION AND DETECTION TECHNIQUES FOR MILLIMETER WAVE TRANSITIONS.
Quarterly progress rept. no. 10, 1 Oct 64-1 Jan 65,
by J. J. Gallagher, R. G. Strauch, and R. E. Cupp.
Apr 65, 42p OR-6386
Contract DA36 039SC90753, Proj. 1P6 22001A056
Unclassified report

See also AD-601 918.

Descriptors: (*Molecular beams, Millimeter waves), (*Millimeter waves, Molecular beams), Detection, Excitation, Resonance, Interferometers, Doppler effect, Electron bombardment, Spectrum analyzers, Electron multipliers, Frequency, Standards.

The alterations of the molecular beam apparatus, which are required for observation of the Ramsey pattern, have been completed. A new interferometer for the beam apparatus has been completed. A description is given of the changes made in the beam ionization system. The distortions of line shapes which are anticipated at millimeter wavelengths are discussed. (Author)

AD-613 474 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Carborundum Co., Niagara Falls, N. Y.
THE CRYSTAL STRUCTURE OF YB4,
by R. F. Giese, Jr., V. I. Matkovich, and J. Economy.
Mar 65, 18p Technical rept. no. TR-8
Contract Nonr407500, Proj. NR056 449
Unclassified report

Descriptors: (*Borides, Crystal structure), (*Yttrium, Borides), X-ray diffraction analysis, Density, Crystal lattice defects.

A structure determination of YB4 was carried out in order to determine the boron positions in metal tetraborides. The structure proposed by earlier workers using the ThB4 was confirmed; however, significant departures in occupany of boron positions were noted. One boron position (B III) was found to be about 25% defective. As a consequence, each octahedral boron group is on the average one atom short. This argues against the earlier proposed structure interpretation based on a continuous framework of boron atoms. A new crystal chemical interpretation of the tetraboride structure is presented in terms of tetrahedral units which demonstrates a structural framework common to MB4, M3B2, and M2B type compounds. (Author)

AD-613 478 Div. 25, 2, 15
CFSTI Prices: HC$5.00 MF$1.25

Navy Underwater Sound Lab., New London, Conn.
ON THE THEORY OF ACOUSTIC WAVE SCATTERING AND REFRACTION BY INTERNAL WAVES.
Research rept.,
by Peter A. Barakos. 15 Feb 65, 193p
Rept. no. USL-649
Projs. 1 400 00 00, S R104 03 01 0587
Unclassified report

Descriptors: (*Underwater sound, Refraction), (*Ocean waves, Refraction), (*Sound transmission, Underwater sound), Mathematical models, Acoustic properties, Integral equations, Boundary value problems, Reflections, Oceanology.

A theoretical treatment of the interaction between an acoustic plane wave and a stationary internal wave of a two-layer fluid is presented. The acoustic plane wave is incident from below upon a sinusoidal boundary separating two liquidhalf-spaces. The incident radiation undergoes reflection, scattering, and refraction at the interface. An integral method is employed to obtain two, exact, simultaneous infinite sets of equations relating the complex boundary amplitude coefficients. Exact expressions for the acoustic velocity potentials for the scattered and transmitted fields have also been found. From the general relations approximate equations have been developed for nine special cases. Two of these cases, important in underwater acoustics, are for small and large values of the product of the acoustic wavenumber and the internal wave amplitude. (Author)

AD-613 486 Div. 25, 4

California Univ., Los Angeles. Dept. of Chemistry.
THE CRYSTAL STRUCTURE OF ALPHA-DIMETHYL-TELLURIUM DICHLORIDE,
by G. D. Christofferson, R. A. Sparks, and J. D. McCullough. 25 Mar 58, 8p
Contract DAO4 495ORD305, Grant NSF G2354
Unclassified report

Pub. in Acta Crystallographica (Denmark) v11 pt11 p782-8 Nov 1958 (Copies available only to DDC users).

Descriptors: (*Tellurium compounds, Crystal structure), (*Metalorganic compounds, Crystal structure), Chlorides, Symmetry (Crystallography), Molecular structure, Chemical bonds, X-ray diffraction analysis, Anisotropy, Fourier analysis.

Alpha-dimethyltellurium dichloride crystallizes in the monoclinic system with the space-group symmetry P2 sub 1/c. There are four molecules of (CH3)2TeCl2 in the unit cell, the dimensions of which are: a = 9.552, b = 6.180, c = 11.314 A (all ±0.010 A), Beta = 97.9±0.1 degrees. The trial structure was determined by use of Fourier syntheses on (010) and (001) based on Weissenberg photographs prepared with Cu K alpha radiation. The structure was refined by use of a three-dimensional Fourier synthesis and five three-dimensional least-squares cycles based on Weissenberg photographs prepared with Mo K alpha radiation. The molecular symmetry approximates mm2 and may be described as a trigonal-bipyramid with one equatorial position vacant. As in other molecules of the type R3SbX2, R2(Se,Te)X2, RICl2, ClF3, etc., the axial bonded distances to the halogen

atoms are longer than the sums of the normal single covalent radii. An unusual feature of the dimethyltellurium dichloride structure is that the Cl-Te-Cl angle is bent toward the methyl groups. In the aromatic compounds such as diphenyltellurium dibromide the bending of these bonds is away from the organic groups. Fairly strong interaction between the tellurium atom of one molecule and one chlorine atom on each of two adjacent molecules is indicated. The positions of the additional chlorine atoms are approximately such as to complete the octahedron about the tellurium atom. (Author)

AD-613 487 Div. 25, 4

California Univ., Los Angeles. Dept. of Chemistry.
THE CRYSTAL STRUCTURE OF DIPHENYLTELLURIUM DIBROMIDE,
by G. D. Christofferson and J. D. McCullough.
12 Sep 57, 8p
Contract DA04 495ORD305, Grant NSF G2354
Unclassified report

Pub. in Acta Crystallographica (Denmark) v11 pt4 p249-56 Apr 1958 (Copies available only to DDC users).

Descriptors: (*Tellurium compounds, Crystal structure), (*Metalorganic compounds, Crystal structure), Bromides, Symmetry (Crystallography), X-ray diffraction analysis, Fourier analysis, Least squares method, Molecular structure, Chemical bonds.

Dephenyltellurium dibromide crystallizes with the space-group symmetry I4 sub I. There are four molecules of (C6H5)2TeBr2 in the unit cell for which a = 11.421±0.010 A and c = 9.817±0.010 A. The trial structure was determined by means of two-dimensional Patterson and Fourier syntheses and refined by means of three-dimensional Fourier syntheses and the least-squares routine on SWAC. The observed bond distances are 2.682±0.003 A for Te-Br and 2.14±0.03 A for Te-C, while the observed bond angles are 178.0±0.2 degrees for Br-Te-Br and 96.3±1.2 degrees for C-Te-C. Packing distances are all consistent with accepted van der Waals radii. (Author)

AD-613 488 Div. 25, 4

California Univ., Los Angeles. Dept. of Chemistry.
THE CRYSTAL STRUCTURE OF ANTIMONY (III) SULFOBROMIDE, SbSBr,
by G. D. Christofferson and J. D. McCullough.
19 May 58, 4p
Grant NSF G2354
Unclassified report

Pub. in Acta Crystallographica (Denmark) v12 pt1 p14-6 Jan 1959 (Copies available only to DDC users).

Descriptors: (*Antimony compounds, Crystal structure), (*Sulfur compounds, Crystal structure), Bromides, Symmetry (Crystallography), Fourier analysis, Molecular structure, Crystal lattices, Chemical bonds, X-ray diffraction analysis.

The structure of SbSBr was refined by means of Fourier syntheses on (001). There are four units of SbSBr in the unit cell for which a = 8.26, b = 9.79 and c = 3.97 A. The space group is Pnam and the atoms all lie in the mirror planes at z = 1/4 and z = 3/4. The refinement resulted in shifts of as much as 0.4 A in the bond distances. The interpretation is a structure consisting of pleated chains of Sb and S atoms along the c axis with bromine present as Br(-) outside the chains. Each Sb has one S atom at 2.49 A and two S atoms at 2.67 A. Each S atom is similarly bonded to three Sb atoms. The bond angles around Sb are 84.1 degrees (2) and 96.3 degrees (1) while those around S are 95.9 degrees (2) and 96.3 degrees (1). The nearest neighbors of Br(-) are two Sb at 2.94 A and one S at 3.46 A. (Author)

AD-613 489 Div. 25

Pittsburgh Univ., Pa.
A NUCLEAR QUADRUPOLE RESONANCE AND X-RAY STUDY OF THE CRYSTAL STRUCTURE OF 2,5-DICHLOROANILINE,
by T. Sakurai, M. Sundaralingam, and G. A. Jeffrey.
11 May 62, 11p
Grants NSF G10119, NSF G19797
Unclassified report

Pub. in Acta Crystallographica (Denmark) v16 pt5 p354-63 May 1963 (Copies available only to DDC users).

Descriptors: (*Crystal structure, Amines), (*Amines, Crystal structure), Nuclear resonance, Quadrupole moments, X-ray diffraction analysis, Aromatic compounds, Chemical bonds.

The crystal structure of 2,5-dichloroaniline, C6H3Cl2NH2, was determined by the combined application of nuclear quadrupole resonance and X-ray diffraction. The molecule is planar, except for the nitrogen which deviates slightly, by 0.06 A. The benzene ring is slightly deformed from the regular hexagon and the observed bond lengths agree well with the result of a simple molecular orbital calculation. There is no hydrogen bonding in the structure. The shortest intermolecular Cl...Cl distance, 3.37 A, is shorter than the usually quoted van der Waals distance of 3.6 A. (Author)

AD-613 490 Div. 25

Indiana Univ., Bloomington.
THE ANGULAR VARIATION OF LIGHT SCATTERED BY SINGLE DIOCTYL PHTHALATE AEROSOL DROPLETS,
by Frank T. Gucker and Robert L. Rowell.
27 Jun 60, 10p
Unclassified report

Pub. in Faraday Society. Discussions (Gt. Brit.) n30 p185-91 1960 (Copies available only to DDC users). Supported by NSF.

Descriptors: (*Phthalates, Aerosols), (*Aerosols, Light transmission), (*Light transmission, Aerosols), Drops, Photometers, Particle size, Refraction, Reflection, Scattering, Refractive index.

The light-scattering diagrams of single aerosol droplets of dioctyl phthalate (bis-2-ethylhexyl phthalate) have been determined by charging them, suspending them in an electrostatic field, illuminating them with monochromatic light of wavelength lambda and measuring the light scattered into a photometer moving over a range of 40 to 140 degrees from the direction of illumination. Particle radius r was calculated from rate-of-fall measurements and the Stokes-Cunningham-Millikan equation. Good agreement was obtained with scattering diagrams calculated from the Mie theory, which indeed provide a more sensitive measurement of particle size than do rate-of-fall measurements. Detailed calculations of scattered intensity according to the Mie theory have been made at angular intervals of 1 degree over the range

of size parameter alpha = (2 pi (r)/lambda) = 0.1(0.1)30.0 for a refractive index of 1.486 and at several values of alpha for a refractive index of 1.50. The number of maxima in the scattering diagrams increases with alpha. Graphs of the angular position of the maxima in the two polarized components show that new maxima are formed by splitting where the curves for the two polarized components intersect and the size parameter is approximately divisible by pi/4. (Author)

AD-613 495 Div. 25

Massachusetts Inst. of Tech., Cambridge.
SCATTERING LOSS FROM MAGNETIC MIRROR SYSTEMS. I-II.
Doctoral thesis,
by D. J. BenDaniel and W. P. Allis. 19 Sep 61, 33p
Unclassified report

Pub. in Plasma Physics, Accelerators, Thermonuclear Research (U.S.) v4 1962 (Copies available only to DDC users).
Supported by ONR, AEC, and NSF.

Descriptors: (*Plasma physics, Charged particles), (*Charged particles, Plasma physics), Nuclear scattering, Statistical functions, Equations, Theory, Special functions (Mathematics), Magnetic fields, Electrons.

The problem of scattering loss of a plasma of singly-charged ions and electrons from magnetic mirror confinement is considered. Using the adiabatic approximation for the behaviour of a charged particle in the absence of collisions, a method is developed in which collisions are treated as a perturbation. The time behaviour of the distribution function of the ions everywhere in the system is found from the reference distribution' at the mid-plane. The 'square well' approximation is treated in detail. An approximation to the ROSENBLUTH equation is developed which permits the problem to be treated in terms of angular modes and transport coefficients. The transport coefficients involve integrals over the speed distribution of the ions; this speed distribution is the solution of a highly non-linear equation and numerical solutions are given for several mirror ratios. The asymptotic form of the distritution function in both angle and speed is discussed. Results are then presented of a study in which the 'square well' treatment was generalized by the reference distribution method to a class of more realistic mirror machine shapes. It is shown that the rate of change of density and energy in such systems may be considered in terms of equations similar in form to those derived for the 'square well'. Graphs presented of the results to numerical calculations in which the independent parameter was the 'shape' of the system. (Author)

AD-613 498 Div. 25, 4

Oxford Univ. (England).
PRESSURE BROADENING STUDIES ON VIBRATION-ROTATION BANDS. III. EXPERIMENTAL METHODS FOR DETERMINING LINE WIDTHS,
by C. Crane-Robinson and H. W. Thompson.
10 Aug 62, 12p
Contract AF61 052 202
Unclassified report

Pub. in Royal Society of London. Proceedings. Series A. Mathematical and Physical Sciences (Gt. Brit.) v272 p441-52 1963 (Copies available only to DDC users).

Descriptors: (*Diatomic molecules, Molecular spectroscopy), (*Molecular spectroscopy, Pressure), (*Band spectrum, Pressure), Absorption spectrum, Line spectrum, Measurement, Carbon compounds, Monoxides, Hydrochloric acid, Deuterated compounds, Impurities, Nitrogen, Great Britain.

The basis of experimental methods for determining the line widths in vibration-rotation bands of diatomic molecules when broadened by foreign gases is explained. These involve the measurement of the relative self- and foreign-gas-broadening coefficients, of the 'equivalent' line widths, or of the peak absorbance values of lines across a band. Some results on self-broadening of CO, and DCl are compared with previous data. (Author)

AD-613 508 Div. 25, 4

Oregon Univ., Eugene.
THE POSITION DEPENDENCE OF COLLISION INDUCED SATELLITES OF ALKALI LINES ON THE NATURE OF THE ALKALI,
by Shang Yi,Ch'en and Ralph A. Wilson, Jr.
27 Jan 61, 12p
AROD 1981:5
Unclassified report

Pub. in Physica (Netherlands) v27 p497-508 1961
(Copies available only to DDC users)
Supported in part by NSF.

Descriptors: (*Alkali metals, Line spectrum), (*Atomic spectroscopy, Alkali metals), Band spectrum, Absorption spectrum, Lithium, Sodium, Potassium, Rubidium, Cesium, Helium, Neon, Argon, Krypton, Xenon.

The dependence of the positions of both the red and the violet satellite bands of alkali lines on the nature of alkalis was investigated from the microphotometer traces of over 100 satellites of the absorption lines of Li, Na, K, Rb and Cs in the presence of He, Ne, Ar, Kr, and Xe. It was found that for a given foreign gas, the absolute magnitudes of satellite-line separation for both red and violet satellites decreased with increasing atomic weights of the alkalis; while for a given alkali, the line separation increased with the atomic weights of the foreign (perturbing) gas for red satellites but decreased for violet satellites. Red satellites were observable only for heavy gases (Kr and Xe). The red satellite separation had a peak value for the third member of Li and for the second member of other alkali absorption series. Violet satellite separations were very large for the resonance lines but decreased so rapidly for the higher members that no satellites were resolved for the second or higher members of the principal series for the heavy gases (Kr and Xe). For a given foreign gas, the red satellite separation for the long wave length component (2)P1/2) of the doublet decreased, while that for the short wavelength component ((2)P3/2) increased with the atomic weight of the alkalis. (Author)

AD-613 512 Div. 25, 15

New York Univ., N. Y.
MEISSNER EFFECT AND FLUX QUANTIZATION IN THE QUASIPARTICLE PICTURE,
by Dietrich A. Uhlenbrock and Bruno Zumino.
29 Jul 63, 12p
Grants NSF G20964, DA ARO D31 124G356
Unclassified report

Pub. in Physical Review (U. S.) v133 n2A pA350-61 Jan 20 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Superconductors, Magnetic fields), (*Nonlinear differential equations, Superconductors), (*Transformations (Mathematics), Superconductors), Quantum mechanics, Thermodynamics, Potential theory, Perturbation theory, Matrix algebra, Electromagnetic fields.

A superconductor in a magnetic field is studied by means of a generalized quasiparticle transformation. Using the minimum principle for the thermodynamic grand potential, nonlinear equations are derived for the superconductor, which can be considered valid at finite temperature. For small magnetic potential these equations are linearized and shown to imply the London formula and the Meissner effect. For a multiply-connected superconductor the nonlinear equations are shown to be consistent with Maxwell's equation only if the magnetic flux is quantized in the units predicted by Onsager. (Author)

AD-613 514 Div. 25

North Carolina Univ., Chapel Hill.
ON THE OBSERVATIONS OF TRANSIENT SPACE-CHARGE-LIMITED CURRENTS IN INSULATORS,
by M. Silver, P. Mark, D. Olness, W. Helfrich, and R. C. Jarnagin. 23 Mar 62, 4p
Grant NSF G17208

Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n10 p2988-91 Oct 1962 (Copies not available to DDC or Clearinghouse customers)
Prepared in cooperation with Polaroid Corp., Cambridge, Mass., and Technische Hochschule, Munich (Germany).

Descriptors: (*Electric insulation, Electric currents), (*Electric currents, Electric insulation), (*Space charges, Electric currents), (*Transients, Electric insulation), Electromagnetic pulses, Voltage.

The conditions for the observation of space-charge-limited (SCL) transient current pulses in insulators are examined. A parameter alpha = 2t sub tau/tau (t sub tau = space-charge-free transit time and tau=response time of the circuit) is defined, whose value determines the extent to which the pulses are distorted from their ideal shape. For alpha>100, the pulses are undistorted. For 20<alpha<100, the pulse shape becomes distorted from the ideal case and for alpha<20, pulses begin to be indistinguishable. It is shown that carrier transport in any insulator may be investigated by transient SCL current measurements provided that trapping is not too severe and that ohmic contact formation (either transient or steady-state) is possible. (Author)

AD-613 520 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Cornell Univ., Ithaca, N. Y.
SPIN RESONANCE IN SOLIDS.
Final rept.,
by Donald F. Holcomb. 26 Mar 65, 14p
Contract Nonr40115

Unclassified report

Descriptors: (*Nuclear spins, Resonance), (*Nuclear magnetic resonance, Solids), Radiofrequency spectroscopy, Crystal lattices, Line spectrum, Resonance adsorption, Color centers, Semiconductors.

Work in the following areas is summarized: Experimental apparatus developments; spin-lattice relaxation processes in solids; characteristics of a heavily-saturated spin system; color centers in ionic crystals; non-metal to metal transition.

AD-613 535 Div. 25
CFSTI Prices: HC$3.00 MF$0.75

Little (Arthur D.) Inc., Cambridge, Mass.
FAR INFRARED SPECTRA OF SELECTED CRYSTALS.
Final rept. for 1 Jun 61-31 Jan 65,
by James R. Aronson and Hugh G. McLinden.
31 Jan 65, 86p
Contract AF19 604 8504, Proj. 5621, Task 562105
AFCRL 65-90

Unclassified report

Descriptors: (*Spectra (Infrared), Crystals), (*Crystals, Spectra (Infrared)), Infrared spectroscopy, Infrared radiation, Wave transmission, Reflection, Germanium, Silicon, Quartz, Sapphire, Calcium compounds, Fluorides, Strontium compounds, Barium compounds, Sodium compounds, Chlorides, Lithium compounds, Cesium compounds, Iodides, Bromides, Magnesium compounds, Oxides, Experimental data.

The report is concerned with the techniques and results of an experimental study of the far infrared spectra of selected crystals at room temperature and in the neighborhood of liquid helium temperature. The spectral range in question was between 35 and 690/cm (285 and 14.5 microns) and both reflection and transmission data were obtained. The crystals examined included germanium, silicon, quartz, sapphire, calcium fluoride, strontium fluoride, barium fluoride, sodium chloride, sodium fluoride, lithium fluoride, cesium iodide, cesium bromide, and magnesium oxide. The data were obtained using a modified Perkin-Elmer 201-C Far Infrared Spectrometer and a Hofman Research Dewar. The reflection data were obtained at 45 degrees incidence. The polarization of the spectrometer was measured and a Kramers-Kronig analysis of some of the data was carried out. (Author)

AD-613 536 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Westinghouse Research Labs., Pittsburgh, Pa.
VAPORIZATION OF MATERIALS BY Q-SPOILED LASER PULSES FOR SPECTROSCOPIC ANALYSIS,
by P. F. Browne. 24 Aug 64, 17p
Scientific rept. no. SR-1
Contract AF19 628 4184, Projs. 5621, 4608,
Tasks 562104, 460802
AFCRL 64 871

Unclassified report

Descriptors: (*Lasers, Spectroscopy), (*Spectroscopy, Lasers), Light pulses, Materials, Heating, Vaporization, Absorption spectrum, Plasma physics.

This report is a preliminary theoretical analysis of the vaporization of materials by focussed high intensity radiation and of the optical emission and absorption properties of the resulting vapor. (Author)

AD-613 575 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Cornell Univ., Ithaca, N. Y.
RESEARCH ON SOFT X-RAY ABSORPTION.
Status rept.,
by D. F. Holcomb. Feb 65, 8p
Contract Nonr40137, Proj. NR017 625

Unclassified report

Descriptors: (*X-rays, Absorption), (*Ionization, Quantum mechanics), Probability, Atomic energy levels, Krypton, Cesium, Iodine.

Experimental work is planned for (1) measurement of the photoionization cross section of krypton in the region 80 to 150 Angstroms and (2) examination, in both absorption and emission, of the elements adjoining xenon because of the large 4d shell photoionization cross section; by the use of cesium and iodine compounds, comparison will be made of atomic theory with solid state absorption data. The photoionization cross sections of xenon and krypton are being calculated from the model wave functions of McGuire and Tomboulian ('Final states in photoionization.' Cornell Univ., Ithaca, N. Y. Technical rept. 4 on Contract DA-31-124ARO(D)-43, March 1964.) By use of the same model, the atomic photoionization cross sections for elements near xenon in the periodic table can be calculated, thereby enabling separation of the atomic and solid state contributions to the cross section. Investigations are planned for extending the model to both higher and lower energies.

AD-613 577 Div. 25, 14
CFSTI Prices: HC$2.00 MF$0.50

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
MOSSBAUER STUDIES ON IRON IN THE PEROVSKITES La1-xSr-xFeO3 (0< or = x< or = 1). CONDITION FOR MAXIMUM RESONANCE ABSORPTION PEAK IN A SINGLE-LINE MOSSBAUER ABSORPTION,
by Uri Shimony and Jens M. Knudsen. Feb 65, 49p
Technical rept. nos. TR-196, TR-197
Contract Nonr184110, Proj. NR018 801
Unclassified report

Descriptors: (*Iron, Mossbauer effect), (*Dielectrics, Mossbauer effect), (*Mossbauer effect, Absorption spectrum), Lanthanum compounds, Strontium compounds, Ferrates, Antiferromagnetism, Cryogenics, Phase studies, Solid solutions, Line spectrum, Specific heat, Crystal structure, Nuclear isomers, Nuclear resonance.

Mossbauer spectra of the perovskite series La1-xSr-x FeO-y (0. 0< or = x < or = 1.0; y Approx. < 3) were obtained with Fe(57) as the photon-emitting and absorbing nucleus and analyzed in detail. The Neel temperature of antiferromagnetic LaFeO3 decreases with increasing Sr concentration, in agreement with previous reports. That of antiferromagnetic SrFeO2.5 (brownmillerite structure) also decreases as oxygen is introduced to transform it to perovskite SrFeO3. Characteristic Fe(4+) lines, identified for compounds of high x, have isomer shifts between +0.10 and +0.20 mm/sec relative to a source of Co(57) in stainless steel Type 310. However, spectra of compounds of intermediate x indicate the existence of an intermediate Fe(3+ to 4+) state, and a correlation between the total isomer shift of a compound and its Fe(4+) content was attempted. With increasing x a significant discontinuity in the total isomer shift, corresponding to a transition from magnetic order to disorder, was found. Line widths vary around 0.40 mm/sec (compared with 0.26 mm/sec, the narrowest line obtainable in the present setup) and show broadening in a sample fired for a short time. The temperature effect was used to calculate the specific heat. (Author)

AD-613 578 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
X-RAY DIFFRACTION STUDIES OF THERMAL MOTIONS IN CRYSTALS.
Quarterly progress rept. no. 22, 1 Sep-30 Nov 64,
by R. A. Young. 25 Jan 65, 5p
Contracts Nonr99100, Nonr99106, Projs. NR017 623, A-389
Unclassified report

See also AD-610 811.

Descriptors: (*Crystals, X-ray diffraction analysis), (*Thermal stresses, Crystals), Test methods, Silicon, Strain (Mechanics), Temperature, Intensity, Motions, Thermal properties, Errors, Measurement, Vibration.

The principal technical effort was directed to the experimental difficulties associated with the measurement of integrated intensity from near perfect crystals. Although results continued to substantiate ideas about the temperature dependence of the integrated intensity, the reproducibility of those results was not satisfactory. The most probable causes of the difficulty seemed to be: (1) Variation of perfection from place to place on the crystal. In this case a small shift in the x-ray beam position would change the integrated intensity and, hence, an apparently different temperature dependence. (2) Crystal strain induced either thermally or by the mounting adhesive. (3) Temperature fluctuations around the apparatus. Instrument changes sufficient to affect the sensitive measurements could thereby be caused. (Author)

AD-613 579 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Laboratory of Molecular Structure and Spectra, Univ. of Chicago, Ill.
MOLECULAR STRUCTURE AND SPECTRA.
Quarterly Status rept. no. 32, 1 Oct-31 Dec 64,
by Robert S. Mulliken. 31 Dec 64, 7p
Contract Nonr212101, Proj. NR014 101
Unclassified report

Descriptors: (*Molecular structure, Molecular spectroscopy), (*Molecular spectroscopy, Molecular structure), Band spectrum, Ultraviolet spectroscopy, Absorption spectrum, Atomic energy levels, Helium, Xenon, Hydrides, Halogens, Silicon, Oxygen, Aluminum, Copper, Silver, Gold.

Theoretical and experimental work in the field of molecular structure and spectra is summarized with the general purpose of obtaining a better and more quantitative understanding of the spectra and energy levels of molecules and of the foundations of structural chemistry.

AD-613 589 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

Boeing Scientific Research Labs., Seattle, Wash.
THE FERROELECTRIC AND STRUCTURAL PROPERTIES OF HAFNIUM OXIDE COMPOUNDS,
by Eleanor Greene Christensen. Sep 64, 47p
Rept. no. D1-82-0377
Unclassified report

Also available from the author.

Descriptors: (*Hafnium compounds, Oxides), (*Ferroelectricity, Hafnium compounds), (*Crystal structure, Hafnium compounds), Dielectric properties, Hysteresis, Ferroelectric materials, Solid solutions, X-ray diffraction analysis, Crystal lattices, Low-temperature research, Calcium compounds, Strontium compounds, Lead compounds, Barium compounds.

The ferroelectric and structural properties of HfO2 compounds, using high purity (99.9%) HfO2 were investigated. The compounds studied were CaHfO3, SrHfO3, and

(Pb,Ba)HfO3 solid solutions. Dielectric measurements were made between room temperature and 300C. Hysteresis loop measurements were made at liquid nitrogen temperature, room temperature and at approximately 120C. The compositions and crystalline structures formed were identified by x-ray diffraction techniques. (Author)

AD-613 606 Div. 25
CFSTI Prices: HC$3.00 MF$0.75

California Univ., Riverside. Dept. of Physics.
SPIN WAVE - SPIN WAVE SCATTERING IN A HEISENBERG FERROMAGNET.
Doctoral thesis,
by Robert Gerald Boyd. Jan 65, 54p
Technical rept. no. TR-3
Grant AF AFOSR523 64
Unclassified report

Descriptors: (*Ferromagnetic materials, Field theory), (*Nuclear spins, Scattering), (*Electromagnetic waves, Scattering), Green's function, Hamiltonian, Dipole moments, Quantum mechanics, Operators (Mathematics), Matrix algebra.

Consideration is given to the scattering on one spin wave from another in a perfect simple cubic Heisenberg ferromagnet with nearest neighbor exchange only. An orthonormal set of two-spin-wave states is displayed, and the exchange hamiltonian is divided into a diagonal part and an off-diagonal part. The Lippmann-Schwinger scattering equation is solved for two spin derivations, and an exact exchange scattering cross section is obtained. The 'Golden Rule' is used to derive, in Born approximation, the dipole scattering cross section. It is concluded that if the Born approximation is valid for dipole scattering and if the ratio of cross sections is similar for face centered cubic lattices, then in EuS dipole scattering swamps out exchange scattering at low temperatures.

AD-613 621 Div. 25, 9, 15
CFSTI Prices: HC$1.00 MF$0.50

Innsbruck Univ. (Austria).
MAGNETOGASDYNAMIC WAVES OF SMALL AMPLITUDE,
by F. Cap and H. Friedel. 14 Jul 64, 14p
Scientific rept. no. SR-12
Contract AF61 052 675
Unclassified report

Descriptors: (*Magnetohydrodynamics, Differential equations), (*Plasma oscillations, Magnetohydrodynamics), Propagation, Fluid flow, Perturbation theory, Compressible flow, Austria.

The basic magnetogasdynamic equations are solved by two methods. In one the calculations are based on linearized equations, the propagation of plane waves being studied in a medium at rest. In the other the theory of characteristics is applied to more general perturbations. Both methods are shown to yield consistent results proving the existence of fast and slow magnetoacoustic waves.

AD-613 622 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Innsbruck Univ. (Austria).
THE JUELICH PLASMA SYMPOSIUM,
by Ferdinand Cap and Karl Lackner. 14 Jul 64, 23p
Scientific rept. no. SR-15
Contract AF61 052 675
Unclassified report

Descriptors: (*Plasma physics, Symposia), Plasma medium, Magnetic pinch, Magnetohydrodynamics, Magnetic fields, Rotation, Shock tubes, Stability, Acceleration, Plasma oscillations, Austria.

The papers presented at the meeting of the European Study Group on Fusion are summarized under four topics: pinch discharges and related investigations; plasma acceleration; plasma confinement; and plasma diagnostics.

AD-613 623 Div. 25, 9, 15

Innsbruck Univ. (Austria).
VORTEX THEOREMS AND POTENTIAL FLOW IN MGD,
by F. Capp and H. Friedel. 25 Sep 64, 10p
Scientific rept. no. SR-14
Contract AF61 052 675
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.
See AD-613 621.

Descriptors: (*Magnetohydrodynamics, Vortices), (*Vortices, Plasma medium), (*Fluid flow, Plasma medium), Differential equations, Potential theory, Austria.

Necessary conditions for the existence of a velocity-potential in MGD are derived on the basis of general MGD vortex theorems. Two types of MGD flows, fulfilling these conditions, are given. The existence of a potential-equation for the special case of a longitudinal magnetic field is shown.

AD-613 624 Div. 25, 9, 15

Innsbruck Univ. (Austria).
VARIATIONAL METHODS FOR THE SOLUTION OF TWO-DIMENSIONAL STEADY MAGNETOGASDYNAMIC FLOWS,
by F. Cap and G. Mueller. 23 Sep 64, 13p
Scientific rept. no. SR-19
Contract AF61 052 675
Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.
See also AD-613 623.

Descriptors: (*Magnetohydrodynamics, Calculus of variations), (*Two-dimensional flow, Plasma medium), (*Calculus of variations, Two-dimensional flow), Potential theory, Compressible flow, Perturbation theory, Austria.

The variational problem describing two-dimensional steady magnetogasdynamic potential flow was transformed and a method to solve it was outlined.

AD-613 658 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

Cornell Univ., Ithaca, N. Y.
A CALCULATION OF THE THERMAL CONDUCTIVITY OF PURE SUPERCONDUCTING LEAD,
by Vinay Ambegaokar and James Woo. Mar 65, 37p
Technical rept. no. TR-2
Contract Nonr40138
See also AD-611 439.
Unclassified report

Descriptors: (*Lead, Thermal conductivity), (*Thermal conductivity, Lead), Superconductors, Phonons, Density, Relaxation time, Mathematical analysis, Mathematical models.

A calculation of the thermal conductivity of normal and superconducting lead has been performed. A semi-empirical model for the density of phonon states and the electron-phonon coupling constants is used. The calculation is based on the strong-coupling theory worked out by Tewordt and Ambegaokar (Phys. Rev. 134A: 805, 1964). It is found that the quasi-particle limit of this theory is valid for the calculation. The results are in fair agreement with experiment. A physical explanation for the anomalously large drop in the thermal conductivity of superconducting lead is suggested. (Author)

AD-613 679 Div. 25
CFSTI Prices: HC$1.00 MF$0.50

Boston Coll., Mass.
OPTICAL SPECTRA OF SEVERAL d(1)-ELECTRON SYSTEMS,
by Joseph H. Chen and J. R. O'Connor. 1959, 7p
Grant NSF G9220
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Atomic orbitals, Absorption spectrum), (*Scandium, Absorption spectrum), (*Yttrium, Absorption spectrum), (*Lanthanum, Absorption spectrum), Electron transitions, Selection rules, Atomic energy levels, Crystal lattices, Impurities, Fluorides.

Spectra are reported for Sc(II) 3d(1), Y(II) 4d(1), and La(II) 5d(1), and it is suggested that the experimental procedures used can be extended so as to observe many transition ions in one electron configuration.

AD-613 684 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

TRG, Inc., Melville, N. Y.
PERTURBED FABRY-PEROT RESONATORS,
by S. R. Barone. Jan 65, 38p
Scientific rept. no. SR-2, 160-SR-2
Contract AF19 604 8817, Proj. 4645, Task 464502
AFCRL 65-173
See also AD-293 401. Unclassified report

Descriptors: (*Resonators, Interferometers), (*Perturbation theory, Resonators), Optical instruments, Lasers, Mirrors, Resonance, Configuration

A theory of the discrete resonances of a Fabry-Perot interferometer is generalized to include configurations that depart somewhat from the ideal geometry. The theory centers on an asymptotically valid differential equation plus impedance boundary conditions for the transverse resonance behavior. For strip mirrors the complex resonant frequencies are evaluated to second order as functionals of the mirror shapes. The result is applied to the specific cases of slightly curved and tilted mirrors. (Author)

AD-613 688 Div. 25
CFSTI Prices: HC$3.00 MF$0.75

Raytheon Co., Waltham, Mass. Research Div.
GASEOUS LASER RESEARCH.
Interim engineering rept. no. 1, 1 May-31 Jul 64,
by F. Horrigan, S. Koozekanani, and R. Tataronis.
31 Jul 64, 58p S-669
Contract AF33 615 1949, Proj. 4156, Task 415608
Unclassified report

Descriptors: (*Lasers, Excitation), (*Helium, Lasers), (*Xenon, Lasers), Atomic energy levels, Probability, Probes (Electromagnetic), Electrons, Distribution functions, Plasma medium, Glow discharges.

The objective of the research effort is to achieve detailed understanding of the excitation mechanisms operative in the xenon and helium-xenon gas lasers. The method of measurement to be used in obtaining the cross sections for electron impact excitation of the various xenon levels of interest is described. A description of the first test vehicle constructed and the results of its tests are given. The basis of our Langmuir probe measurement procedure is discussed. The experimental results are given, indicating that the method chosen seems to be able to produce, in a direct fashion, reliable curves of the electron distribution function. Estimates of xenon lifetimes were obtained by means of the Bates-Damgaard approximation. An application of the rate equation and various simple assumptions were applied to the xenon system, resulting in expressions for laser power and population inversion as functions of electron density for one special case. The theory of a diffusion-controlled glow discharge was modified to include the effects of the metastables found in all the rare gases. (Author)

AD-613 690 Div. 25, 15
CFSTI Prices: HC$1.00 MF$0.50

Innsbruck Univ. (Austria).
ON THE CONCEPT OF SPINORS IN GENERAL RELATIVITY,
by Werner Raab. 14 May 64, 12p
Special scientific rept. no. SSR-7
Contract DA91 591EUC2682
Unclassified report

See also AD-423 912.

Descriptors: (*Relativity theory, Tensor analysis), (*Tensor analysis, Relativity theory), Matrix algebra, Transformations (Mathematics), Differential geometry.

A spinor calculus is derived from tensor calculus and corresponds to the linear differential geometry based on four invariant linear differential forms. In the special theory of relativity, the concept 'system of coordinates' and 'frame' can be identified; in the general theory of relativity the system of coordinates which is common for all points of a certain space-time region has to be differentiated from the frame for every point. A frame is represented by four invariant linear differential forms, i.e. by four tensors of first rank.

AD-613 693 Div. 25, 15
CFSTI Prices: HC$2.00 MF$0.50

Oklahoma Univ. Research Inst., Norman.
CALCULATION OF THE CROSS SECTION OF ELECTRON-ATOM INELASTIC COLLISIONS.
Final rept. for Sep 63-Sep 64,
by Chun C. Lin. Sep 64, 29p
Contract AF19 628 3299, Proj. 7674, Task 76758
AFCRL 65-36 Unclassified report

Descriptors: (*Excitation, Atoms), (*Electrons, Excitation), (*Probability, Excitation), Electron transitions, Diatomic molecules, Atomic energy levels, Mercury, Oxygen, Resonance.

The electron excitation cross sections of the 63P1 to 63P2 in mercury was investigated. A partial wave analysis was performed and the two-channel approximation used to remove the angular dependence of non-diagonal interaction potentials. For the partial wave of low l, the cross sections were calculated by the method of exact resonance while the Born approximation was used for the cases of large l. The calculation of the electron excitation cross sections of the (2p)4 1D > (2p)4 1S transition in oxygen was made by means of the usual partial wave method in the coupled representation. For l = 0 and l = 1, the exchange effect between the incident electron and the atomic electrons must be taken into account and the exact-resonance approximation may be used to decouple the differential equations. The partial cross sections with higher l may be calculated by the usual Born approximation. The problem of excitation of the vibrational energy levels of diatomic molecules by electron impact was studied. Calculations of the vibrational excitation cross sections for polar diatomic molecules were made by taking the interaction potential as the monopole-dipole type. The effects of the interaction of the incident electron and the induced dipole were examined. (Author)

AD-613 699 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

Barus Research Lab. of Physics, Brown Univ., Providence, R. I.
STUDY OF SURFACE PROPERTIES OF ATOMICALLY-CLEAN METALS AND SEMICONDUCTORS.
Progress rept. no. 6, 1 Jun-31 Dec 64,
by H. E. Farnsworth and B. D. Campbell. Jan 65, 26p
Contract DA28 043AMC00299E, Proj. 1A010501B010
Unclassified report

Descriptors: (*Cadmium compounds, Sulfides), (*Surface properties, Cadium compounds), (*Semiconductors, Surface properties), Oxygen, Adsorption, Mass spectroscopy, Crystals, X-ray diffraction analysis, Ion bombardment, Catalysis, Electrical properties, Metals, Electron diffraction analysis.

Oxygen adsorption on the (0001) matte surface of Cds was enhanced when an intense light was incident on the crystal. A 3 to 5 Torr-min oxygen exposure in intense light extinguished the diffraction pattern, whereas a 750 Torr-min exposure in the dark had little effect on the pattern, although it caused a slight decrease in the conductivity of the surface. High temperature heating in vacuum (850C) produced (1103) thermal etch planes on the (0001) matte surface. It was found that the presence of oxygen before or during the light exposure increased the effect of the light. It was also found that ion bombardment increased the dark conductivity and greatly decreased the effect of an intense light. From these observations it is noted that (1) the observed changes in conductivity took place in a region close to or at the surface as suggested by the effect of ion bombardment, and (2) exposure of the crystal to oxygen and/or an intense light decreased the conductivity near the surface, possibly indicating photoabsorption of oxygen. Unlike the (0001) matte surface the (0001) specular surface was not affected by exposure to an intense light. Oxygen exposures of 750 degrees Torr-min in the dark and 3300 Torr-min in an intense light produced very little change in both the diffraction pattern and the subsequent dark conductivity of the (0001) specular surface. (Author)

AD-613 701 Div. 25
CFSTI Prices: HC$2.00 MF$0.50

RIAS, Inc., Baltimore, Md.
EMBRITTLEMENT OF ZINC MONOCRYSTALS AND BICRYSTALS BY MERCURY AND GALLIUM,
by M. H. Kamdar and A. R. C. Westwood. Mar 65, 38p Technical rept. no. TR-65-3
Contract DA31 124AROD63
AROD 3937:4
Unclassified report

Descriptors: (*Single crystals, Fracture (Mechanics)), (*Zinc, Fracture (Mechanics)), (*Mercury, Adsorption), (*Gallium, Adsorption), Liquid metals, Coatings, Crystal lattice defects, Brittleness, Stresses, Strain (Mechanics).

A study was made of the fracture behavior of zinc monocrystals and asymmetric bicrystals tested in tension at room temperature while coated with liquid mercury or gallium. The results are consistent with the view that adsorption of the active liquid metal specifically at some stable obstacle to slip is a prerequisite for embrittlement. Thus, carefully prepared and handled monocrystals, oriented for single slip and tested in tension, are not embrittled by mercury or gallium unless these liquid metals are adsorbed specifically at kink bands formed during deformation in the vicinity of the grips. The data from the bicrystal studies provide experimental support for the theoretical criteria for fracture in zinc proposed by Likhtman-Shchukin and Gilman. From this data, a value of 48 ± 3 ergs/sq cm was deduced for the fracture surface energy of zinc in the presence of mercury, in good agreement with an earlier determination of this quantity by the present authors. The results of the investigation are discussed with regard to earlier work by Shchukin and others. (Author)

AD-613 713 Div. 25, 15
CFSTI Prices: HC$1.00 MF$0.50

Innsbruck Univ. (Austria).
PRINCIPAL IDEAS ON SPINOR TRANSFORMATIONS IN THE RIEMANNIAN SPACE,
by Walter Majerotto. 25 Aug 64, 15p
Scientific rept. no. SR-8
Contract DA91 591EUC2947
Unclassified report

Descriptors: (*Relativity theory, Transformations (Mathematics)), (*Transformations (Mathematics), Algebraic topology), Groups (Mathematics), Invariance, Differential geometry, Momentum, Spin, Austria.

It is shown that it is impossible to construct 'Riemannian spinors' such that their transformations are homomorphic to the Riemannian transformations or the representations of the latter contained in the former, similar to the representations of the tensor transformations of the Lorentz group are contained in the spinor-representations of the unimodular group C sub 2, does not eliminate the possibility of introducing the spinor concept in the Riemannian space without making the spinor into an invariant.

AD-613 726 Div. 25, 17

Cavendish Lab., Univ. of Cambridge (England).
THE DEPENDENCE OF CROSS-SLIP ON STACKING-FAULT ENERGY IN FACE-CENTRED CUBIC METALS AND ALLOYS,
by P. R. Thornton, T. E. Mitchell, and P. B. Hirsch.
5 Jun 62, 21p

Contract AF61 052 98
AFOSR 2934

Unclassified report

Pub. in Philosophical Magazine (Gt. Brit.). v7 n80 p1349-69 Aug 62.
Copies available only to DDC users.

Descriptors: (*Alloys, Crystal lattice defects), (*Crystal lattice defects, Metals), Great Britain, Crystal structure, Copper alloys, Zinc alloys, Temperature, Strain (Mechanics), Stresses, Mathematical analysis, Electron microscopy.

The results of an experimental study of the temperature and strain-rate dependence of tau sub III (the stress at the onset of stage III) for Cu-Zn alloys are described and interpreted in terms of Seeger's theoretical analysis of tau sub III (the stress at the onset of stage III). The values of the stacking-fault energy, gamma, derived in this way are compared with the estimates of gamma for the same alloys obtained directly from electron microscope observations of dislocation nodes. The two sets of values are found to disagree, and the nature of the discrepancy is such as to throw serious doubts on the applicability of the Seeger analysis to Cu-based alloys with e/a>1.10. The lower limits of gamma for pure Cu and Ag, from electron microscope data, are approximately 60 ergs/sq cm and approximately 20 ergs/sq cm; the values of gamma deduced from Seeger's tau sub III analysis are approximately 170 ergs/sq cm and approximately 30 ergs/sq cm respectively. The lower limit of gamma for Cu is inconsistent with the previously accepted figure based on the assumption that gamma is twice the twin boundary energy, and this assumption is now held to be invalid. Seeger's model of cross-slip at Lomer-Cottrell barriers is examined critically, and found to be incompatible with the observations in Cu and Al that screws are held up preferentially. (Author)

AD-613 738 Div. 25

Institute for the Study of Metals, Univ. of Chicago, Ill.
INVESTIGATION OF IMPURITY CONDUCTION IN TRANSMUTATION-DOPED GERMANIUM,
by H. Fritzsche and M. Cuevas. 1960, 4p
Contract AF49 638 802
AFOSR 3337

Unclassified report

Pub. in mono. International Conference on Semiconductor Physics, Prague, 1960. Proceedings, p222-4 (Copies available only to DDC users).

Descriptors: (*Germanium, Impurities), (*Solid state physics, Germanium), Gallium, Arsenic, Heat of activation, Cryogenics, Semiconductors, Resistance (Electrical).

Gallium and arsenic impurities were introduced into pure and previously doped germanium by slow neutron irradiation and subsequent nuclear transmutation. Three problems were studied. (1) The dependence of impurity conduction on the average impurity separation for fixed compensation K. (2) The transition to metallic impurity conduction. (3) The K dependence of the activation energy of impurity conduction. The results are compared with Miller's theory and the orbit radius of the acceptor is deduced. (Author)

AD-613 739 Div. 25, 20

Brandeis Univ., Waltham, Mass.
INTERACTION BETWEEN GAUGE VECTOR FIELDS,
by R. Arnowitt and S. Deser. 20 Jun 63, 11p
Grant NSF G15751

Unclassified report

Pub. in Nuclear Physics (Netherlands) v49 p133-43 1963 (Copies available only to DDC users).

Descriptors: (*Field theory, Vector analysis), (*Vector analysis, Field theory), Electromagnetism, Mesons, Bosons, Quantum mechanics, Partial differential equations, Baryons.

The interaction between massless vector fields possessing gauge invariance of the second kind and the Maxwell field is considered. A discussion is given of the special properties of gauge fields and of the definition of minimal electromagnetic coupling. The inconsistency of minimal coupling for the systems in question is reviewed. It is then shown that while a particular nonminimal coupling is consistent for the fields in question, even the latter becomes inconsistent in the presence of other known charged fields. Thus such fields as that of Yang-Mills or the 'baryon' gauge field cannot carry charge unless all other charged fields in nature also form appropriate multiplets. (Author)

AD-613 741 Div. 25

Cavendish Lab., Univ. of Cambridge (England).
THE STRAIN-RATE DEPENDENCE OF THE FLOW STRESS OF COPPER SINGLE CRYSTALS,
by P. R. Thornton, T. E. Mitchell and P. B. Hirsch.
16 Jun 61, 22p
Contract AF61 052 98
AFOSR 3421

Unclassified report

Pub. in Philosophical Magazine (Gt. Brit.). v7 n74 p337-58 Feb 1962.
Copies available only to DDC users.

Descriptors: (*Copper, Crystal lattice defects), (*Crystal lattice defects, Stresses), Single crystals, Strain (Mechanics), Creep, Crystal growth, Thermodynamics, Great Britain.

An experimental study is described of the strain-rate sensitivity of the flow stress of Cu single crystals in all stages of deformation and over a wide temperature range. The curves relating the increase in flow stress on increasing the strain-rate by a fixed amount to the flow stress are generally divisible into three regions a, b and c. Region a is linear and characteristic of easy glide. At the end of this region the rate of stress increase with strain increases, and a transition region, b, occurs in which the stress increase varies with flow stress much more slowly than in easy glide. Another linear region, c, of the stress increase versus flow stress, of intermediate slope, begins during stage II and is characteristic of the latter part of stage II and of stage III of the work-hardening curves. The lower the test temperature, the greater is the range in stage II in which the linear region c applies. There is no change in the curves of the stress increase versus flow stress at the onset of stage III. The slope of region c is similar for crystals deforming by single or double slip, and is of the same order of magnitude as that for polycrystals. The results agree with those of previous workers in that the temperature dependence of the flow stress is greater during easy glide than in stages II and III. The two linear regions, a and c, are thought to correspond to two different arrangements of dislocations, the transition from one type of arrangement to the other taking place in region b. (Author)

AD-613 743 Div. 25

Institute for the Study of Metals, Univ. of Chicago, Ill.

THE THEORY OF IMPURITY CONDUCTION,
by N. F. Mott and W. D. Twose. 1960, 57p
Contract AF49 638 802
AFOSR 3359

Unclassified report

Pub. in Philosophical Magazine (Gt. Brit.) v10 n38 suppl p107-63 Apr 1961 (Copies available only to DDC users)
Prepared in cooperation with Cambridge Univ. (England).

Descriptors: (*Semiconductors, Impurities), (*Electrical conductance, Semiconductors), Crystal lattice defects, Field theory, Resistance (Electrical), Crystals, Vibration, Functions.

Contents:
The model and general discussion of impurity conduction.
The impurity wave functions.
Observations of impurity conduction.
Methods of calculating the electrical conductivity at low concentrations.
The properties of a one-dimensional disordered lattice.
The interaction of localized carriers with lattice vibrations.
Calculations of impurity conduction.
Dependence of the transition concentration on degree of compensation.
Concentration at which the transition occurs.
Resistivity in the region of metallic conduction.

AD-613 746 Div. 25, 15

Leyden State Univ. (Netherlands).
ON THE QUANTUM STATISTICAL BASIS OF NON-EQUILIBRIUM THERMODYNAMICS. III,
by J. Vlieger, P. Mazur, and S. R. De Groot.
6 Jul 61, 5p
AFOSR 1848

Unclassified report

Pub. in Physica (Netherlands) v27 p974-8 1961 (Copies available only to DDC users).

Descriptors: (*Thermodynamics, Quantum statistics), (*Quantum statistics, Thermodynamics), Statistical functions, Distribution theory, Statistical distributions, Netherlands.

The quantum statistical theory of Wigner distribution functions, which has been developed in the two previous papers on the foundations of non-equilibrium thermodynamics for Maxwell-Boltzmann statistics, is extended in the present paper to the cases of Bose-Einstein and Fermi-Dirac statistics. (Author)

AD-613 749 Div. 25

Aerospace Research Labs., Office of Aerospace Research, Wright-Patterson AFB, Ohio.
UNIT-CELL DIMENSIONS OF Ni-Pd ALLOYS AT 25 AND 900C,
by L. R. Bidwell and R. Speiser. 4 May 64, 4p
ARL 65-30

Unclassified report

Pub. in Acta Crystallographica (Denmark) v17 pt11 p1473-4 1964 (Copies available only to DDC users)
Prepared in cooperation with Ohio State Univ., Columbus.

Descriptors: (*Crystal lattices, Nickel alloys), (*Nickel alloys, Palladium alloys), (*Palladium alloys, Nickel alloys), Volume, Temperature, X-ray diffraction analysis, Molecular properties, Crystal structure.

The cell constants of Ni-Pd alloys were measured at 25 and 900C with a Unican, 19 cm, high-temperature x-ray powder camera using Cu K alpha radiation. The At.% of Pd was varied from 0 to 100%. The cell constants and molar volume are given and compared with published data.

AD-613 757 Div. 25

Harvard Coll., Cambridge, Mass. Observatory.
ELECTRODYNAMICS IN A ROTATING SYSTEM OF REFERENCE,
by W. M. Irvine. 19 Oct 63, 12p

Unclassified report

Pub. in Physica (Netherlands) v30 p1160-70 1964. (Copies available only to DDC users).

Descriptors: (*Electric fields, Intensity), (*Magnetic fields, Intensity), Rotation, Velocity, Transformations (Analysis), Tensor analysis, Vector analysis.

The usual definition of electric and magnetic field intensities (E and H) in a non-inertial coordinate system is not unique. A system of reference is here newly defined as a continuous, three dimensional distribution of observers, with each of which a frame of reference (orthonormal tetrad) is associated. The fields E and H in such a reference system will always be given by the same physical measurements as determine these quantities in an inertial system, once the effect of inertial (fictitious) forces has been subtracted out. A rotating reference system is strictly defined, and it is shown that E and H in this system are related to the corresponding quantities in an inertial system by a special Lorentz transformation with velocity v=omega times r, where omega is the angular velocity of the rotating system as observed from an inertial system. The field equations in the rotating reference system are given. (Author)

AD-613 768 Div. 25, 8

Air Force Cambridge Research Labs., Bedford, Mass.
SILICON CURRENT AMPLIFIER FOR MICROAMPERE CURRENT LEVELS,
by B. Buchanan, S. Roosild, and R. Dolan. 1 Jul 64, 9p AFCRL 65-78, IP-56
Proj. 5621, Task 5621 03

Unclassified report

Pub. in Institute of Electrical and Electronics Engineers. Proceedings (U. S.) v52 n11 p1364-5 Nov 1964. Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Transistors, Silicon), (*Current amplifiers, Transistors), (*Silicon, Transistors), Solid state physics, Semiconductors, Performance (Engineering), Design.

A small current amplifying device (scad) utilizing what is believed to be a heretofore unused field effect transistor amplification technique is proposed. Theoretical indications and initial results on the small current amplifying capabilities of this device are promising. Unlike conventional transistors, the measured characteristics of this device show that the current gain increases as current decreases below 1 microampere input signal level. (Author)

AD-613 780 Div. 25

Minnesota Univ., Minneapolis.

FERROMAGNETIC RESONANCES IN THIN FILMS,
by D. Chen and A. H. Morrish. Nov 61, 3p
Contract AF49 638 803
AFOSR 1685

Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n3 suppl. p1146-7 Mar 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ferromagnetic materials, Metal films), (*Metal films, Ferromagnetism), (*Magnetic resonance, Metal films), Microwave spectroscopy, Absortion spectrum, Iron alloys, Nickel alloys, Cobalt, Iron, Nickel, Magnetic properties.

The ferromagnetic resonance spectra of thin films of Permalloy and other materials have been investigated. Frequently more than one maximum in the resonance line is observed. The evidence from various experiments indicates that films with more than one resonance peak are stratified. A simple model in which two layers of film are coupled via the dipole-dipole interaction is considered. (Author)

AD-613 783 Div. 25

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
DISLOCATION DYNAMICS AT LOW TEMPERATURES,
by J. Lothe and J. P. Hirth. 12 Mar 59, 9p
Contract AF49 638 551
AFOSR 3394

Unclassified report

Pub. in Physical Review (U. S.) v115 n3 p543-50 Aug 1 1959.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Crystal lattice defects, Low temperature research), Single crystals, Metals, Heat of activation, Creep, Aluminum, Nucleation, Stresses, Mathematical analysis.

A model for low-temperature dislocation motion is developed using the concept of nucleation and growth of kinks in dislocations lying in Peierls potential troughs. The model is compared with existing experimental data. (Author)

AD-613 788 Div. 25

Columbia Univ., New York.
SPIN RELAXATION IN OPTICAL PUMPING,
by Robert A. Bernheim. 5 May 61, 6p
Contract AF49 638 785
AFOSR 900

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v36 n1 p135-40 Jan 1 1962(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Rubidium, Relaxation time), (*Pumping (Electronics), Rubidium), Vapors, Helium, Pressure, Atomic energy levels, Spin, Electrons, Theory, Hamiltonian.

The spin relaxation of optically aligned rubidium vapor has been studied as a function of helium buffer gas pressure. Relaxation times as long as 0.68 sec were observed in helium at 112-atm pressure. The diffusion constant D sub 0 for rubidium in helium at 50C was evaluated as 0.54 sq cm/sec. The disorientation cross section sigma for rubidium-helium collisions was found to be 6.2 x 10 to -25th power sq cm. A mechanism for spin relaxation in optically aligned alkali vapors is proposed and discussed. It is found that the relaxation arises from the coupling of the alkali electron spin to orbital and rotational motion accompanying the collision. The variation of sigma for rubidium in the presence of other inert gases is also discussed. (Author)

AD-613 792 Div. 25, 14

Poulter Research Labs., Stanford Research Inst., Menlo Park, Calif.
FORMATION OF AN AMORPHOUS FORM OF QUARTZ UNDER SHOCK CONDITIONS,
by Paul S. De Carli and John C. Jamieson.
29 Sep 59, 3p
Contract AF49 638 625
AFOSR 3660

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v31 n6 p1675-6 Dec 1959 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Quartz, Phase studies), (*Shock waves, Quartz), Crystallography, Transformations, Explosive forming, High-pressure research, Phase studies, Equations of state, Single crystals, Glass.

An investigation was made of the formation of an amorphous form of quartz under high pressure shock conditions. Explanations for the formation of amorphous material from single crystals in these experiments are: (1) Although hydrodynamic theory has been successfully applied to the explanation of a variety of effects associated with the passage of intense shock waves through solids, the theory may not fit the case of quartz. Hence the pressure and temperature calculations may be in error and the phenomenon observed was simply fusion under lower pressures and higher temperatures than those calculated. (2) If a great many dislocations are formed in the shock front, the reversion of the disordered state to crystallinity may be mechanically impossible. This explanation may be related to the disordering of quartz by neutron bombardment. (3) Alpha (or beta) quartz may melt metastably at temperatures well below the melting point of the stable form of SiO2. This last hypothesis is supported at least qualitatively by current data.

AD-613 795 Div. 25

Weizman Inst. of Science, Rehovoth (Israel).
1 (1)S, 2 (1)S, AND 2 (3)S STATES OF Li(+),
by C. L. Pekeris. 8 Dec 61, 3p
Contract AF61 052 510
AFOSR 3168

Unclassified report

Pub. in Physical Review (U. S.) v126 n1 p143-5 Apr 1 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Lithium, Atomic energy levels), Ground state, Electron transitions, Ionization, Energy, Determination, Tables, Israel.

The ionization energy J, excluding the Lamb shift, of the ground state of Li(+) has been evaluated for determinants up to order n =444. We get J(444)=610087.449/cm, and an extrapolated value J infinity -610087.445/cm. For the 2(1)S state we get a theoretical ionization energy of 118704.88/cm, as against the experimental

value of 120008.30±0.10/cm determined by Herzberg and Moore. For the 2(3)S state our value for the ionization energy comes out 134044.12/cm, in excellent agreement with the experimental value of 134044.19±0.10/cm determined by Herzberg and Moore. (Author)

AD-613 797 Div. 25

Michigan State Univ., East Lansing.
MAGNETIZATION AND PROTON RELAXATION TIME IN ANTIFERROMAGNETIC LiCuCl3.2H2O,
by R. D. Spence and C. R. K. Murty. 31 Jul 61, 2p
Contract AF49 638 613
AFOSR 3360
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v35 n5 p1912-3 Nov 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Lithium compounds, Antiferromagnetism), (*Antiferromagnetism, Quantum mechanics), Relaxation time, Magnetic fields, Nuclear magnetic resonance, Crystal substructure, Protons, Crystal lattices, Nuclear spins, Copper compounds, Chlorides, Temperature.

AD-613 800 Div. 25, 4

Georgetown Univ., Washington, D. C.
POWER SERIES EXPANSIONS OF VIBRATIONAL POTENTIALS. II. TWO CLASSICAL POTENTIALS FOR IONIC MOLECULES,
by Edward J. Finn and Charles L. Beckel. 25 Aug 60, 2p
Grant AF AFOSR60 1
AFOSR 3127
Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v33 n6 p1887-8 Dec 1960 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Molecular properties, Series), (*Diatomic molecules, Vibration), (*Series, Diatomic molecules), Electrostatics, Polarization, Lithium compounds, Sodium compounds, Indium compounds, Fluorides, Chlorides, Iodides, Atomic energy levels, Ions.

Vibrations in diatomic molecules are not yet well enough understood to permit reliable extrapolation from known energy levels to unknown ones. In a previous note some vibrational properties associated with a simple covalent potential were described. The results of a similar study are reported for two simple ionic potentials. These results were obtained through use of Dunham's power series technique. The first ionic potential that was expanded consisted of an exponential repulsion term and a 1/r Coulomb attraction term. The second expansion was of a potential that retained these two terms and added an attractive 1/r to the 4th power polarizability term. The two potentials were applied to three alkali halides and two indium monohalides.

AD-613 801 Div. 25

Honeywell Research Center, Hopkins, Minn.
GALVANOMAGNETIC COEFFICIENTS OF SINGLE-CRYSTAL TELLURIUM,
by Allen Nussbaum and Robert J. Hager.
3 May 61, 7p
Contract AF49 638 908
AFOSR 3387
Unclassified report

Pub. in Physical Review (U. S.) v123 n6 p1958-64 Sep 15 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Tellurium, Magnetic properties), (*Single crystals, Tellurium), Measurement, Atomic energy levels, Electron transitions, Pressure, Hall effect, Differential equations, Symmetry, High-temperature research, Cryogenics, Solid state physics.

The twelve galvanomagnetic coefficients of tellurium crystals grown by the Czochralski method were measured over the temperature range 77-300K. The results of these measurements plus previous measurements at 4.2K and a determination of the effect of pressure on one of the Hall coefficients are combined with symmetry characteristics to postulate an energy band structure. This structure differs from those previously proposed on the basis of tight-binding methods or by simple applications of group theory. (Author)

AD-613 819 Div. 25

Carnegie Inst. of Tech., Pittsburgh, Pa.
MOSSBAUER EFFECT IN I127,
by F. de S. Barros, N. Ivantchev, S. Jha, and K. Rama Reddy. 13 Oct 64, 3p
Grant AF AFOSR278 63
AFOSR 65-0488
Unclassified report

Pub. in Physics Letters (Netherlands) v13 n2 p142-4 Nov 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Iodine, Line spectrum), (*Mossbauer effect, Iodine), Atomic energy levels, Spectroscopy, Absorption, Isotopes.

Observations were made of stable iodine isotope line spectra using the absorber sodium paraperiodate.

AD-613 850 Div. 25

Westinghouse Research Labs., Pittsburgh, Pa.
STUDY OF THE GROWTH MECHANISM AND TWIN HABITS OF Ba2TiP2O9,
by D. E. Harrison and W. A. Tiller. 2 Feb 62, 8p
Contract AF49 638 1029
AFOSR 2127
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v33 n8 p2451-7 Aug 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Crystal growth, Metallic crystals), (*Symmetry (Crystallography), Crystal growth), (*Metallic crystals, Crystal growth), Nucleation, Crystal structure, Crystal lattice defects, Barium, Titanium, Phosphates.

Crystals of Ba2TiP2O9 were grown from the melt by the Bridgman technique. Two types of twinning occur, namely: growth twins and mechanical twins. The growth twins form with the (100) plane as the twin plane and mechanical twins form with the (001) plane as the twin plane. In twinned crystals, growth proceeds most rapidly in the (010) direction. Rapid growth in this direction is believed to result from efficient nucleation at the re-entrant corners formed by the (310) faces of the twin components. The mechanical twins form according to pseudo-merohedral symmetry by reflection across the (001) twin plane. The angle of obliquity is 4 degrees and the twinning shear is 0.140. (Author)

AD-613 852 Div. 25, 4

California Univ., Berkeley.
INFRARED SPECTRA OF GASEOUS DIAZOMETHANE,
by C. Bradley Moore and George C. Pimentel.
12 Sep 63, 13p
Contract AF49 638 944
AFOSR 65-0521

Unclassified report

Pub. in Journal of Chemical Physics (U. S.) v40 n2 p329-41 Jan 15 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Organic nitrogen compounds, Infrared spectroscopy), (*Infrared spectroscopy, Organic nitrogen compounds), Deuterated compounds, Isotopes, Band spectrum, Measurement.

The gaseous infrared spectra of CH2N2, CHDN2, CD2N2, and CH2N15N were examined between 230 and 4000/cm under medium resolution. Band positions were measured for all the distinguishable parallel features. Nearly all of the perpendicular fundamentals were resolved and analyzed. The rotational constants derived are: CH2N15N, 8.747±0.015/cm; CD2N2, 4.353±0.01/cm; CHDN2, 5.72±0.1/cm. These data combined with that given earlier for the CH2N2 isotope, show that the averaged distance of the hydrogen atoms from the molecular axis (in CH2N2 and in CH2N15N) is 0.9580±0.0006 A and of the deuterium atoms (in CD2N2) is 0.9560±0.001 A. In contrast to earlier studies no evidence was found for the presence of a tautomeric form of diazomethane in the samples studied. (Author)

AD-613 857 Div. 25, 17

Case Inst. of Tech., Cleveland, Ohio.
MAGNETORESISTANCE INVESTIGATION OF THE FERMI SURFACE OF MAGNESIUM,
by R. W. Stark, T. G. Eck, W. L. Gordon, and F. Moazed. 5 Apr 62, 4p Reprint no. 1575
Grant AF AFOSR62 222
AFOSR 3120

Unclassified report

Pub. in Physical Review Letters (U. S.) v8 n9 p360-2 May 1 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Magnesium, Magnetic properties), Resistance (Electrical), Atomic energy levels, Electron transitions, Work functions, Surfaces, Solid state physics, Magnet fields, Crystals.

This Letter summarizes the results of a detailed investigation of the transverse magnetoresistance of Mg and shows that these results are in essential agreement with Falicov's Fermi surface (the free-electron surface with dimensions adjusted by the band calculation) as modified by Cohen and Falicov to take into account the effects of spin-orbit coupling and magnetic breakdown.

AD-613 863 Div. 25, 15

Polytechnic Inst. of Brooklyn, N. Y.
ON LINEAR EQUATIONS OF ANISOTROPIC ELASTIC PLATES,
by Yi-yuan Yu. 3 Feb 64, 5p
Contract AF49 638 1290
AFOSR 65-0556

Unclassified report

Pub. in Quarterly of Applied Mathematics (U. S.) v22 n4 p357-60 Jan 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Elasticity, Equations), (*Structural parts, Elasticity), Hamiltonian, Flat plate models, Series, Partial differential equations, Stresses, Strain (Mechanics).

In the paper the generalized Hamilton principle and the associated variational equation of motion for linear and anisotropic elastic plates are deduced from their counterpart in general elasticity theory, through expansion of the displacement and strain in infinite power series and by carrying out the integration in the thickness direction of the plate. The Euler equations of the variational principle then yield the complete system of plate equations of all orders.

AD-613 882 Div. 25

Enrico Fermi Inst. for Nuclear Studies, Univ. of Chicago, Ill.
CONSIDERATIONS ON THE MAGNETIC FIELD PROBLEM IN SUPERCONDUCTING THIN FILMS,
by Yoichiro Nambu and San Fu Tuan. 22 Jul 63, 14p
Grant AF AFOSR274 63
AFOSR 65-0486

Unclassified report

Pub. in Physical Review (U. S.) v133 n1A pA1-14 Jan 6 1964 (Copies not available to DDC or Clearinghouse customers).
Prepared in cooperation with Chicago Univ., Ill. Dept. of Physics, and Purdue Univ., Lafayette, Ind. Dept. of Physics.

Descriptors: (*Films, Superconductors), (*Superconductors, Films), (*Magnetic fields, Films), Quantum mechanics, Perturbation theory, Theory, Electrons, Surface properties, Phase studies, Statistical analysis, Magnetic properties.

The results obtained in a previous paper on the magnetic field dependence of the energy gap in superconductivity for bulk specimen to thin-film superconductors are adapted, using the model of discrete quantization in momentum space. Only the case of parallel and constant external magnetic field along the film surfaces is considered. A series of elementary theorems and some specific calculations lead to the conclusions: (1) A second-order phase transition should be observed at all temperatures for thin film thicknesses. (2) A simple scaling rule exists concerning the field and temperature dependence on the energy gap. (3) The critical field H sub c depends on thickness L and reduced temperature t like H sub c equals approximately L to-3/2 power (ln(1/t)) to 1/2 power for not too thin films (L greater than 0.5 x 10 to -5 power cm). The behavior changes as the film becomes very thin or as the temperature becomes moderately low. A crude comparison with available experimental data seems to bear out the conclusions qualitatively. (Author)

AD-613 890 Div. 25

Lincoln Lab., Mass. Inst. of Tech., Lexington.
ELECTROMAGNETIC MODE MIXING IN NONLINEAR MEDIA.
Revised ed.,
by R. H. Kingston and A. L. McWhorter.
26 Oct 64, 10p Rept. no. JA-2446
Contract AF19 628 500

Unclassified report

Pub. in Institute of Electrical and Electronics Engineers.

Proceedings (U. S.) v53 n1 p4-12 Jan 1965
(Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 10 Sep 64.

Descriptors: (*Electromagnetic waves, Nonlinear systems), (*Nonlinear systems, Electromagnetic waves), Electrical properties, Magnetic properties, Propagation, Resonance, Tensor analysis, Cavity resonators, Perturbation theory, Lasers.

A general theory of the coupling of electromagnetic modes in a nonlinear dielectric or magnetic medium is developed. The rate at which the mode amplitudes change, either in time or in space, is derived by a perturbation method similar to that previously used for stationary perturbations. The technique is illustrated by applying it to the problems of producing harmonic generation and parametric oscillation with a high-power laser, confocal resonator modes being used to describe mathematically both the focused laser beam and the output radiation. A comparison is made of resonant vs nonresonant structures for second harmonic generation, and threshold conditions are obtained for parametric oscillation. In addition, by combining the Manley-Rowe relations (Proc. IRE, 44:904-913 (July 1956)) with the coupled mode equations, an alternative derivation of the symmetry properties of the nonlinear susceptibility tensor is given. (Author)

AD-613 891 Div. 25

Lincoln Lab. Mass. Inst. of Tech., Lexington.
PRESSURE DEPENDENCE OF THE ALPHA-BETA TRANSITION TEMPERATURE IN SILVER SELENIDE,
by Mario D. Banus. 2 Dec 64, 2p Rept. no. JA-2456
Contract AF19 628 500

Unclassified report

Pub. in Science (U. S.) v147 n3659 p732-3 Feb 12 1965.
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Transition temperature, Selenium alloys), (*Selenium alloys, Siver alloys), (*Silver alloys, Selenium alloys), Phase studies, Transition temperature, Pressure, Transformations, Crystal lattices, Silver compounds, Selenides.

The pressure dependence of the alpha-beta transition temperature in Ag2Se was determined by observing the temperature at which the sharp change in resistivity occurs when Ag2Se is transformed from the low-temperature orthorhombic to the high temperature body-centered-cubic form. The transition temperature increased from 133C at 1 atmosphere to 298C at 47 kilobars. The value of the heat of transformation of 2.19 kcal/mol measured calorimetrically agreed well with the value calculated from dT/dP of the transition. (Author)

AD-613 892 Div. 25

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SEMICONDUCTOR LASERS,
by Robert H. Rediker. 1965, 7p Rept. no. JA2464
Contract AF19 628 500

Unclassified report

Pub. in Physics Today (U. S.) v18 n2 p42-50 1965
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Semiconductors, Lasers), (*Lasers, Semiconductors), Theory, Intermetallic compounds, Gallium alloys, Arsenic alloys, Diodes (Semiconductor), Pumping (Electronics), Magnetic fields, Pressure, Temperature.

AD-613 894 Div. 25, 2

Lincoln Lab., Mass. Inst. of Tech., Lexington.
FOURTH TEST OF GENERAL RELATIVITY,
by Irwin I. Shapiro. 13 Nov 64, 3p
Rept. no. JA-2483
Contract AF19 628 500

Unclassified report

Pub. in Physical Review Letters (U. S.) v13 n26
pW553 1-3-3 Dec 28 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Relativity theory, Test methods), (*Radio astronomy, Relativity theory), Radar pulses, Wave transmission, Radar echo areas, Detection, Time-lag theory, Extraterrestrial radio waves, Mercury (Planet), Venus.

This fourth test of general relativity was made possible by recent advances in radar astronomy. The test involves measuring the time delays between transmission of radar pulses towards either Venus or Mecury and detection of the echoes.

AD-613 895 Div. 25, 17

Lincoln Lab., Mass. Inst. of Tech., Lexington.
BAND STRUCTURE AND MAGNETISM OF GADOLINIUM METAL,
by J. O. Dimmock and A. J. Freeman.
18 Nov 64, 3p Rept. no. JA-2486
Contract AF19 628 500

Unclassified report

Pub. in Physical Review Letters (U. S.) v13 n25
pX517 1-3-3 Dec 21 1964 (Copies not available to DDC or Clearinghouse customers).
Prepared in cooperation with National Magnet Lab., Mass. Inst. of Tech., Cambridge.

Descriptors: (*Gadolinium, Atomic energy levels), (*Magnetism, Gadolinium), Electron transitions, Magnetic properties, Work functions.

The letter reports some results of a nonrelativistic augmented plane wave (APW) calculation of the electronic energy bands in gadolinium metal. The calculated conduction bands differ markedly from those of the free-electron model, and instead closely resemble those of the transition metals. This is due to the fact that bands originating from atomic 5d and 6s states overlap and are strongly mixed. The bands near the Fermi surface are of mixed s-d character and yield a density of states about three times that given in the free-electron model. This accounts for the large observed saturation magnetization of Gd metal and may account for the high electronic specific heats of rare-earth metals.

AD-613 903 Div. 25

Lincoln Lab., Mass. Inst. of Tech., Lexington.
LONGITUDINAL INJECTION-PLASMA LASER OF InSb,
by Ivars Melngailis. 28 Dec 64, 2p JA-2505
Contract AF19 628 500

Unclassified report

Pub. in Applied Physics Letters (U. S.) v6 n3
p59-60 Feb 1 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Lasers, Diodes (Semiconductor)), (*Indium alloys, Lasers), (*Antimony alloys, Lasers),

(*Semiconductors, Lasers), Plasma physics, Luminescence, Injection, Pumping (Electronics), Electric currents, Electron transitions, Cavity resonators, Light, Optics.

Coherent emission was obtained in n(+)pp(+) InSb structures parallel to the direction of the diode current, near 10K with 50-nsec current pulses of 20 amp with a minimum longitudinal magnetic field of 7 kG. Comparison of the wavelength and the magnetic shift with earlier data on InSb diodes indicates that the highest energy state of the spin-split lowest Landau level is involved in the transition. The mode spacing near 13 kG is 120 A and remains very nearly at this value as the wavelength is shifted over 1300 A by a magnetic field change of 11.3 kG. As in earlier experiments the mode position changed slightly with magnetic field as a result of a change in the index of refraction. For the longitudinal cavity length of 220 microns the experimental mode spacing corresponds to a value of 5.2 for n sub 0-lambda sub 0 (dn/d lambda).

AD-613 905 Div. 25

Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTICALLY PUMPED SEMICONDUCTOR LASER,
by R. J. Phelan, Jr. and R. H. Rediker.
8 Jan 65, 2p Rept. no. JA-2515
Contract AF19 628 500
Unclassified report

Pub. in Applied Physics Letters (U. S.) v6 n4 p70 Feb 15 1965 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Semiconductors, Lasers), (*Lasers, Semiconductors), Indium alloys, Antimony alloys, Gallium alloys, Arsenic alloys, Pumping (Electronics), Light, Optics.

Laser action was obtained in optically pumped n-type InSb. The required pump power densities were obtained by using the emission from a GaAs diode laser. The InSb emission showed resolution limited line narrowing and a sharply defined threshold pumping intensity. At the higher pumping intensities multimode operation was observed. The system here described for optically pumping InSb should make possible the study of all the semiconductor laser materials with bandgaps less than 1.4 eV at liquid-helium temperatures.

AD-613 906 Div. 25

Cornell Univ., Ithaca, N. Y. Graduate School of Aerospace Engineering.
NOTE ON MAGNETIC LOOPS,
by Y. Mimura and B. P. Leonard. 1 Mar 63, 2p
Contract AF49 638 674; Grant AF AFOSR 62 201
Unclassified report

Pub. in Physics of Fluids (U. S.) v6 n10 Oct 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Magnetohydrodynamics, Magnetic fields), Electric currents, Boundary layer, Fluid flow, Separation, Integral equations, Transformations (Mathematics).

Consideration is given to a simply connected region of space, free from externally applied electric fields, containing a fluid of scalar conductivity and finitely conducting bodies of arbitrary configuration. It is proved that, for the steady flow of this fluid, there can be no magnetic-field loops in the space.

AD-613 908 Div. 25, 8

Institute for Fluid Dynamics and Applied Mathematics, Univ. of Maryland, College Park.
VELOCITY MODULATION OF A RELATIVISTIC ELECTRON BEAM,
by P. C. T. DeBoer. 27 May 64, 4p
Unclassified report

Pub. in Journal of Applied Physics (U. S.) v35 n10 p2789-92 Oct 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 10 Sep 63.

Descriptors: (*Electron beams, Velocity), Integral equals, Partial differential equations, Perturbation theory, Density, Statistical functions, Relativity theory, Momentum.

Velocity modulation of a one-dimensional electron beam is treated relativistically, starting from the collisionless Boltzmann equation and using first-order perturbation theory. A general expression for the perturbation current density j1 is applied first to a mono-energetic unperturbed beam. Compared to the non-relativistic case, the magnitude of j1 is reduced by the factor (1 - u2/c2)3/4, where u is the unperturbed beam velocity and c the velocity of light. The distance between the maxima of j1 is increased by the inverse of the same factor. Relativistic effects decrease the efficiency of modulation eta, which is defined as the energy carried by the electric field generated by the perturbations, divided by the energy flux in the unperturbed beam. For an unperturbed beam with a rectangular velocity distribution of narrow width w and a fixed mean velocity u sub m, the results are independent of w to first order. Expressions for j1 and eta are also found for an unperturbed beam with a rectangular momentum distribution of arbitrary width. When this width is small and increasing as u sub m is fixed, j1 increases in second order if the beam is highly relativistic or if its plasma frequency is larger than the frequency of modulation, while it decreases otherwise. Under either condition eta decreases in second order. (Author)

AD-613 912 Div. 25, 15

Cornell Univ., Ithaca, N. Y.
NONADIABATIC MOTION OF A CHARGED PARTICLE IN AN AXISYMMETRIC MAGNETIC BARRIER. Revised ed.,
by J. Reece Roth. 9 Dec 63, 8p
Unclassified report

Pub. in Physics of Fluids (U. S.) v7 n4 p536-43 Apr 1964 (Copies not available to DDC or Clearinghouse customers)
Revision of manuscript submitted 1 Aug 63.

Descriptors: (*Charged particles, Motion), (*Motion, Magnetic fields), Inductance, Partial differential equations.

A study was made of the motion of a single charged particle in the magnetic induction generated by an axisymmetric current sheet, the current of which was sinusoidally modulated along the axis. Several adiabatically invariant quantities were investigated, and it was found that M varied least along a given trajectory. A particle was considered to be adiabatic if M varied by less than 5% during a single interaction with the magnetic barrier. An averaging process was found which made it possible to predict the relations between particle mass and energy, and the magnetic induction strength and geometry, which cause M to vary by more than 5% during a single interaction with the magnetic barrier. Experimental apparatus was constructed which made it possible to study a single

interaction of a beam of charged particles with a magnetic barrier under steady-state conditions. An experimental procedure was developed which made it possible to detect the transition from adiabatic to nonadiabatic reflection of the ion beam, and the results were compared with the results of the numerical computation. (Author)

AD-613 913 Div. 25

Avco-Everett Research Lab., Everett, Mass.
FLOW MODEL FOR LARGE RADIUS-RATIO MAGNETIC ANNULAR SHOCK-TUBE OPERATION.
Research notes,
by F. J. Fishman and H. Petschek. 22 Jan 62, 2p
Rept. no. AMP-81
Contract AF49 638 659 Unclassified report

Pub. in Physics of Fluids (U. S.) v5 n5 p632-3 May 1962 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Shock tubes, Models (Simulations)), Hypersonic flow, Gas flow, Shock waves, Plasma medium, Magnetic fields, Electrodes.

A model is proposed that explains features of behavior of magnetic annular shock tubes of large radius ratio as reported by Keck (J. C. Keck. Current distribution in a magnetic annular shock tube. Physics of fluids, 5:630-632 (May 1962)). Topics discussed are shape of the current sheet when the center electrode is positive, speed of the current sheet, and difference between positive and negative operation.

26. Production and Management

AD-613 183 Div. 26

Cornell Univ., Ithaca, N. Y. Sibley School of Mechanical Engineering.
SAMPLING PROCEDURES AND TABLES FOR LIFE AND RELIABILITY TESTING BASED ON THE WEIBULL DISTRIBUTION (MEAN LIFE CRITERION).
Quality control and reliability rept.,
by Henry P. Goode and John H. K. Kao.
30 Sep 61, 64p Technical rept. no. TR-3
Unclassified report

Available from Superintendent of Documents, GPO, Washington, D. C. 20402, $0.40, as D7.15:3.

Descriptors: (*Sampling, Quality control), (*Quality control, Sampling), Reliability, Life expectancy, Tests, Acceptability, Production, Failure (Mechanics), Distribution, Probability, Statistical analysis, Conversion ratio, Graphics, Tables.

A proposed acceptance-sampling procedure is presented together with tables of sampling plans for life and reliability testing when the underlying life distribution of items is of the Weibull form. The procedures and plans are for use when inspection of the sample items is by attributes with the life test truncated at some specified time. Lot quality is evaluated in terms of mean item life. A set of conversion factors is provided from which attribute sampling-inspection plans of any desired form may be designed for the Weibull model or from which the operating characteristics of any given plan may be determined. A comprehensive collection of Weibull sampling-inspection plans was designed. Also included are tables of ratios for adapting the Military Standard 105B plans to life testing and reliability applications. In all three of these elements of the study and the report, the exponential model is included as a special case of the Weibull distribution. Both the procedure and plans are for products for which the value for the Weibull shape parameter is known or can be assumed. Conversion factors and tables are provided for a wide range of values for this parameter. (Extracted)

AD-613 184 Div. 26

Cornell Univ., Ithaca, N. Y.
SAMPLING PROCEDURES AND TABLES FOR LIFE AND RELIABILITY TESTING BASED ON THE WEIBULL DISTRIBUTION (RELIABLE LIFE CRITERION).
Quality control and reliability,
by Henry P. Goode and John H. K. Kao. 15 Feb 63,
71p Technical rept. no. TR-6
Unclassified report

Available from Superintendent of Documents, GPO, Washington, D. C. 20402, $0.45, as D-715:6.

Descriptors: (*Statistical distributions, Tables), (*Reliability, Statistical distributions), (*Sampling, Quality control), Life expectancy, Test methods, Production, Statistical tests.

The report outlines an acceptance-sampling procedure and presents tables of related sampling-inspection plans for the evaluation of lot quality in terms of reliable life which is the life beyond which some specified proportion of the items will survive. Tables of plans are supplied for three reliability indices, .50, .90, and .99. The Weibull distribution, including the exponential and the Rayleigh distributions as special cases, is assumed as a statistical model for item lifelength. The evaluation of sample items is by attributes with lifetesting being truncated at the end of a specified period of time. Tables of conversion factors are also provided from which other sampling-inspection plans of desired form can be designed and for use in evaluating the operating characteristics of other specified sampling-inspection plans in terms of item reliable life. A supplementary procedure and associated tables of factors are also included for use in determining the minimum lifetesting time required for sample items to provide assurance at a confidence level of .95 that the items in the lot or population meet the reliable life specified. Factors are provided for this alternative procedure for a representative range of sample sizes and acceptance numbers. Another table of factors are provided for lot evaluation under this procedure in terms of mean item life. (Author)

AD-613 200 Div. 26, 18
CFSTI Prices: HC$1.00 MF$0.50

Army Missile Command, Redstone Arsenal, Ala.
Directorate of Procurement and Production.
DICE: DEVELOPMENT INDEPENDENT COST ESTIMATE. SYNOPSIS, DEFINITION 'TERMS'. PART I. BACKGROUND, PURPOSE, SCOPE. PART II. COLLECTION OF DATA, PREPARATION OF DATA. PART III. SUMMARY.
1 Apr 64, 21p
Unclassified report

Descriptors: (*Army procurement, Costs), (*Costs, Army procurement), (*Data processing systems, Costs), Least squares method, Computers, Punched cards, Labor.

The purpose of this report is to explain a set of procedures that, when followed by the person (analyst) preparing a cost estimate, will eliminate the time-consuming task of manually computing learning curves, i.e. least-squares regression curves using curvilinear curves where the logarithm (base 10) of the dependent and independent variables are used instead of the actual values of the variables. The learning or experience curves apply to both direct manhours and dollar cost. Variables for the curve are obtained from the present contracts for procurement. The scope of the report and the procedures described cover the follow-on type contract where there has been cumulative total dollar and direct labor manhour cost data reported on at least two reports and at least one unit completed for each report. Two reports with two or more units and cost of each are necessary so that two points of data will determine a curve. A typical cost estimate for a new contract might require 40 manhours to compute the required learning curves. The same data can be processed in the manner described with a scientific computer within a few minutes, depending on the type computer used. The time required for preparation of data for manual computation and for computer processing is approximately the same.

AD-613 201 Div. 26, 12, 18
CFSTI Prices: HC$2.00 MF$0.50

Army Missile Command, Redstone Arsenal, Ala.
Directorate of Procurement and Production.
SCAMP: SYSTEMS CHARACTERISTICS AFFECTING MISSILE PRODUCTION; MOTOR LOADING.
25 Nov 63, 48p
Unclassified report

Descriptors: (*Guided missiles, Costs), (*Army procurement, Guided missiles), (*Rocket motors (Solid propellant), Costs), Production, Handling, Manpower studies, Numerical analysis, Performance

(Engineering), Statistical analysis, Probability, Programming (Computers).

Summary: The only data necessary for making a prediction of the cost (or man-hours) of loading a solid propellant motor are the characteristics and these data should be available at the time an estimate is needed. The multiple correlation coefficients are unusually high. The deviations of the calculated values are small. Using seven points of data, the T-test for the cost data study indicates that only one independent variable is significant for 95% probability. Due to the rapidly changing technology in the missile industry, the motor loading costs have been inadequately recorded to permit a definite establishment of the universe and its parameters. Although the range of the data used in this study is relatively large, it should be pointed out that as future missile systems are developed, their characteristic values could be considerably greater or smaller than those used in this study. A cautious approach should be taken when extrapolations are made using the equations presented here. Extrapolations made beyond the range of actual data should be considered a rough estimate, adequate for budgetary planning but probably inadequate for evaluation of contractor proposals. If a solid propellant motor is loaded by the Army, with the standard Army procurement practices being used, and with no unusual quirks or deviations from the general design features of the motors used in this study, a useable estimate should be expected. (Author)

AD-613 260 Div. 26, 30, 32
CFSTI Prices: HC$1.00 MF$0.50

System Development Corp., Santa Monica, Calif.
NEW FRONTIERS OF QUALITY CONTROL.
Professional papers,
by Paul Peach. 23 Mar 65, 15p Rept. no. SP-2009
Unclassified report

Descriptors: (*Quality control, Management engineering), (*Documentation, Quality control), (*Management control systems, Programming (Computers)), Computers, Reports.

The role of management in the control of quality goals in documentation and computer programming is discussed. Suggestions for eliminating the duplication of scientific research efforts and for the improvement of existing documentation systems are presented. These suggestions include control over the selection of documents for publication, improved distribution methods, and the upgrading of the level of scientific writing.

AD-613 261 Div. 26, 17
CFSTI Prices: HC$2.00 MF$0.50

Defense Metals Information Center, Columbus, Ohio.
METAL REMOVAL BY ELECTROCHEMICAL METHODS AND ITS EFFECTS ON MECHANICAL PROPERTIES OF METALS,
by John A. Gurklis. 7 Jan 65, 45p
Rept. no. DMIC-213
Contract AF33 615 1121, Proj. 8975
Unclassified report

Descriptors: (*Electroerosive machining, Metals), (*Chemical milling, Metals), (*Electrolytic polishing, Metals), Mechanical properties, Hydrogen embrittlement, Steel, Beryllium, Nickel alloys, Cobalt alloys, Refractory metals, Refractory metal alloys, Titanium alloys, Surface properties, Oxidation.

This report assembles and correlates information on the effects of electrochemical metal-removal (ECMR) processes on mechanical properties. Of special interest and concern are the effects of ECMR on fatigue strength. The report covers four electrochemical metal-removal processes: electrochemical machining (ECM), electrolytic grinding (EG), electrochemical milling, and electropolishing. General characteristics and applications of the four methods are presented and discussed; special emphasis is placed on ECM. The ECMR processes are especially useful in shaping high-strength and difficult-to-machine metals and alloys, as well as in shaping parts with unusual, complex, or fragile characteristics. (Author)

AD-613 268 Div. 26, 30
CFSTI Prices: HC$4.00 MF$0.75

RAND Corp., Santa Monica, Calif.
A MODEL PUNCHED CARD SYSTEM FOR PRODUCTION CONTROL,
by L. S. Hill. 6 Jan 61, 105p Rept. no. P-2065
Unclassified report

Descriptors: (*Punched cards, Production control), (*Production control, Punched cards), (*Management planning, Production control), Costs, Data processing systems, Scheduling, Coding, Inventory control, Machine tools, Management control systems, Models (Simulations), Manufacturing methods, Control systems.

A well-considered, ordered, and thoroughly integrated procedure for control of production employing Electric Accounting Machines (EAM) is presented. Such machines are used in the procedure to record, coordinate, and analyze all procurement, material control, cost control, and tool control data. Much of the effort in industry to date has been oriented toward the mechanization of clerical processes with relatively little effort on the total control system. This paper is concerned with the development of a system for control of manufacturing from time of raw material receipt through the transformation into finished product.

AD-613 356 Div. 26, 17
CFSTI Prices: HC$1.00 MF$0.50

Astronuclear Lab., Westinghouse Electric Corp., Pittsburgh, Pa.
PILOT PRODUCTION AND EVALUATION OF TANTALUM ALLOY SHEET.
Quarterly rept. no. 10, 28 Oct 64-28 Jan 65,
by R. L. Ammon and A. M. Filippi. 28 Feb 65, 16p
WANL-PR-M-012
Contract NOw-64-0394-d
Unclassified report

See also AD-607 102.

Descriptors: (*Tantalum alloys, Rolling (Metallurgy)), (*Rolling (Metallurgy), Tantalum alloys), Sheets, Melting, Forging, Hafnium alloys, Tungsten alloys, Carbon alloys.

This quarterly report describes the melting and fabrication of two 4 inch diameter T-222 double arc melted ingots. Ingot breakdown by both side forging and upset forging was investigated. Both procedures yielded essentially defect free slab suitable for rolling to sheet. The success of side forging, however, implied that large ingots could be fabricated to slab without requiring the cutting of relatively small lengths for upsetting. In

addition to this, side forging of large ingots would produce a slab shape requiring less trim conditioning in preparation for rolling to sheet than that required on an upset slab. Because of these considerations, the second 4 inch diameter ingot was side forged to slab in preparation for rolling to sheet. (Author)

AD-613 452 Div. 26
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
NEW TYPES OF ALL-METAL ELASTIC-DAMPING ELEMENTS, THEIR PREPARATION AND APPLICATION,
by A. M. Soifer and V. N. Buzitskii. 24 Mar 65, 13p FTD-TT-64-1033
TT 65-61943

Unclassified report

Unedited rough draft trans. of mono. Rasseyanie Energii pri Kolebaniyakh Uprugikh Sistem, Kiev, 1963, p. 269-275.

Descriptors: (*Vibration isolators, Metals), Material forming, Wire, Cold working, Damping, USSR.

The damping elements are made of MR (metallic rubber) the structural basis of which is a spatial lattice of thin metallic spiral, similar to rubber macromolecules. Made in form of a special elastic-damping elements, (washer, bushing, membrane, plate, etc), the MR material can be used in joining and contact places of details and units of machines for dampening mechanical oscillations, and also in the suspension of aggregates, devices and mechanisms for absorption of shock.

AD-613 453 Div. 26, 14
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
PLASTIC FRICTION DISKS,
by A. Os'machko, V. Luganskaya, and Yu. Egerev.
24 Mar 65, 6p FTD-TT-64-1180 Unclassified report
TT 65-61944

Unedited rough draft trans. of Mashinostroitel' (USSR) 1960, no. 12, p. 36-37.

Descriptors: (*Clutches, Disks), (*Disks, Friction), (*Composite materials, Friction), Polyester plastics, Asbestos, Abrasives, Graphite, Tin, Wear resistance, Silver, Powder metals, Processing, Cermets.

The article describes plastic friction disks for electromagnetic couplings. The friction material consists of 22% fibrous asbestos, 14% carborundum, 15% silver graphite, 5% tin in powder and 44% of polyester resin solution.

AD-613 470 Div. 26, 15, 18, 32
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
AN OBJECTIVE BAYES APPROACH FOR INVENTORY DECISIONS,
by G. J. Feeney and C. C. Sherbrooke.
Mar 65, 34p Rept. no. RM-4362-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Inventory analysis, Stock level control), (*Stock level control, Inventory analysis), Probability, Distribution (Economics), Statistical analysis, Inventory control, Management planning.

An approach to demand analysis, based on a mathematical technique called Bayesian inference, is described. Instead of trying to give a point estimate of the item's true mean demand, this approach estimates the probability that the item's mean demand is at various levels. An objective procedure is developed for determining the Bayesian prior distribution of an item's true mean demand from data on the entire system of inventory items. Employing a multivariate log normal prior distribution, it is possible to refine the estimate of an item's true mean demand by considering all relevant information, including unit cost and engineering estimates, as well as past demand data. Complicated models of the demand process, such as the compound Poisson, are readily accommodated. The advantages of Bayesian analysis in non-stationary problems are explored. It is expected that the Bayesian approach will be particularly important where item demand is low and erratic. The memorandum demonstrates that Bayesian analysis can lead to significant improvements in inventory management with only a slight increase in computation. The contention is illustrated with an example of recoverable item stock levels at a representative air base.

AD-613 530 Div. 26, 14, 25
CFSTI Prices: HC$2.00 MF$0.50

Singer Mfg. Co., Bridgeport, Conn.
INVESTIGATION OF PLASTIC REPLICA MIRROR OPTICAL COMPONENTS.
Final technical rept., Phase 1.
29 Mar 61, 50p
Contract DA19 020ORD5237
FA N5058

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
Copy is available for public sale.

Descriptors: (*Mirrors, Epoxy plastics), (*Casting, Epoxy plastics), (*Epoxy plastics, Mirrors), Optical properties, Glass, Molding, Spheres, Reflection, Plastics, Films, Molding materials, Aging (Materials), Optical images, Degradation.

In the present state of the art, it is not practicable to produce plastic replica spherical and aspherical mirrors to be used in place of conventional glass components, except in the case of energy-collecting components with apertures of six inches or less with optical precision considerably less than required for image-forming applications. The basic problems of this investigation have been materials problems concerning the life of glass master mirrors and concerning the adjustment of resin properties to produce satisfactory replicas. To make much more improvement, future work should investigate three areas: (1) Alternate material for master mirrors; (2) Alternate techniques, such as making the negative by casting a thin layer of resin between an insert and the master mirror and (3) A much more sophisticated look at the conditions of temperature, shrinkage and expansion which occur during a casting and curing cycle. (Author)

AD-613 586 Div. 26
CFSTI Prices: HC$9.20 MF$3.00

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.

TECHNICAL-ECONOMIC FOUNDATIONS OF STANDARDIZATION IN MACHINE BUILDING,
by A. A. Kokhtev. 3 Mar 65, 620p
FTD-TT-64-669
TT 65-61972

Unclassified report

Unedited rough draft trans. of mono. Tekhniko-Ekonomicheskie Osnovy Standardizatsii v Mashinostroenie, Moscow, 1963, 431p.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Manufacturing methods, Standards), (*Standards, Manufacturing methods), (*Machines, Standardization), Machine shop practice, Machine tools, Economics, Automation, USSR, France, East Germany, West Germany, United States.

Contents:
Standardization and its varieties
Development of domestic standardization in machine building
Definition of fundamental concepts and terms in standardization
Trends and principles of standardization in building of machines
Subject field, limiting features and standardization and normalization system in building of machines
Mathematical basis of standardization
Four-order standards system in building of machines
Dimensional series and parametric standards for machines and equipment
Standardization of quality requirements for machine building products
Standardization of common machine components and subassemblies
Adaption of standards and normal standards
Numerical designation systems for products of machine building and materials used
Interrelationship between standardization, specialization and automation of production in machine building.

AD-613 619 Div. 26, 15

Aerospace Corp., Los Angeles, Calif.
TABLES OF FACTORS TO FIND CONFIDENCE LIMITS FOR THETA (MTBF) ASSUMING THE POISSON FREQUENCY DISTRIBUTION,
by Josephine Block and Tedd K. Kawata. 10 Dec 63, 11p Rept. no. TOR-269(4303)-5

Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Quality control, Probability), (*Tables, Statistical tests), Statistical distributions, Reliability, Reliability (Electronics), Tests, Failure (Mechanics).

Tables have been constructed to find upper and lower confidence limits for MTBF at values alpha = 0.5, 0.2, 0.1, 0.05, and 0.01, and for one-sided lower confidence limits at values alpha = 0.5, 0.25, 0.1, 0.05, 0.25, 0.01, and 0.005. The tables should help reliability engineers in more easily computing confidence limits from accumulated test data. (Author)

AD-613 630 Div. 26, 30
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
A WORKING DEFINITION OF REAL-TIME CONTROL,
by Edward A. Nelson. Mar 65, 26p P-3089

Unclassified report

Descriptors: (*Management control systems, Real time), (*Real time, Management control systems), Management engineering, Computers, Control sequences, Factor analysis, Decision making, Control.

Control is the process of assuring the confirmity of plans and events. Real-time control requires that the response of each element of the control system is such that the combined effect of all elements produces results that are sufficiently expenditious to preclude failure of the system. A real-time control system is concerned with a flow process through time. It thus arises out of, and is intimately connected with the concepts of distribution logistics. The proper functioning of a real-time control system requires the use of every one of its elements, and any one element may become the critical factor. It is not necessarily the elements themselves, but rather the precise interrelationship of these elements, with time, that makes a control system a real-time control system. Progress in the development of real-time systems therefore involves attention to every element and its relation to the others. The elements of a real-time system are: forecasting, communication, decision, control mechanism, and criteria. (Author)

AD-613 696 Div. 26, 9
CFSTI Prices: HC$3.00 MF$0.75

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
STABILITY INVESTIGATION OF TILTING-PAD BEARINGS. I. THEORETICAL FOUNDATIONS. Interim rept.,
by E. J. Gunter, Jr. and V. Castelli. Feb 65, 81p
I-B2131-1
Contract DA31 124ARO D147,
Projs. 4372, 20010501B700
AROD 4372:1

Unclassified report

See also AD-601 765.

Descriptors: (*Journal bearings, Stability), (*Perturbation theory, Journal bearings), Rotor blades (Turbomachinery), Gas bearings, Mechanics, Compressible flow, Pressure, Partial differential equations, Geometry.

Tilting-pad journal bearings exhibit excellent stability characteristics under ordinary circumstances, but under certain extreme operating conditions they may develop some form of self-excited whirl instability. This first interim report presents the fundamental equations governing the tilting-pad bearing configuration, in which the system geometry, kinematics and Reynolds equation are develop in detail. This report presents a method of analysis of the stability of this type of bearing based on the small perturbation technique. (Author)

AD-613 871 Div. 26, 17

Frankford Arsenal, Philadelphia, Pa. Research and Development Directorate.
IMPROVED WELD STRENGTH IN 2000 SERIES ALUMINUM ALLOYS,
by D. E. Schillinger, I. G. Betz, F. W. Hussey, and H. Markus. 1963, 9p
Rept. no. A63-8
Proj. 1H 024401A111

Unclassified report

Pub. in Welding Journal (U. S.) v42 Research Suppl. Jun 1963 (Copies not available to DDC or Clearinghouse

customers).
Presented at the AWS National Meeting held in Milwaukee, Wis., Oct 1-4, 1962.

Descriptors: (*Aluminum alloys, Welds), (*Welding, Aluminum alloys), Coolants, Quenching (Cooling), Effectiveness, Tensile properties, Ductility, Grain boundaries, Melting, Sheets, Arc welding, Aging (Materials), Microstructure, Low-temperature research.

The use of coolants during the welding of 2000 series aluminum alloys was investigated in an attempt to improve the properties of fusion welds in these alloys. The general premises behind this experimentation were that cooling combined with minimal welding heat inputs should narrow the heat-affected zones and should increase the quenching rates in both the weld bead and heat-affected zone. It was believed that beneficial effects on weld properties might be obtained in this way. A metallographic study of welds made with and without coolants indicated these postulates to be true. Weld heat-affected zones and zones of eutectic and grain boundary melting were narrowed, and dendritic structure in weld beads was refined when coolants were used. In addition, joint efficiencies of 90% or better were obtained for 2014-T6 sheet without solution treatment and both with and without artificial aging after welding. Joint efficiencies exceeding 85% were also obtained for 2024-T86 sheet without postweld solution treatment. (Author)

27. Propulsion Systems

AD-613 353 Div. 27, 17, 25
CFSTI Prices: HC$2.00 MF$0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
STRENGTH OF DUCTILE METAL MOTOR CASES.
Technical rept.,
by G. Sachs, L. Schapiro, and O. Hoffman.
Jun 61, 43p Rept. no. 6-90-61-9
Unclassified report

Rept. on Flight Sciences.

Descriptors: (*Rocket cases, Steel), (*Pressure vessels, Failure (Mechanics)), (*Steel, Rocket cases), Cylindrical bodies, Structures, Stresses, Mathematical analysis, Theory, Rupture, Experimental data, Tensile properties, Deformation, Ductile, Brittleness.

Experimental data for steel motor cases which behaved in a ductile manner to burst, are compared with theories both for yield behavior, and behavior at plastic instability. It is concluded that end domes of actual vessels affect behavior of cylindrical sections in a manner which departs from present theories when length/diameter ratios of motor cases approach small values. Present theories require modification for finite-length, closed-end vessels. (Author)

AD-613 634 Div. 27, 25
CFSTI Prices: HC$2.00 MF$0.50

Avco Everett Research Lab., Everett, Mass.
PERFORMANCE CHARACTERISTICS OF A MAGNETIC ANNULAR ARC,
by R. M. Patrick and A. M. Schneiderman.
Mar 65, 48p Research rept. no. RR-209
Contracts AF49 638 659, NAS3 5748
Unclassified report

Descriptors: (*Plasma medium, Particle accelerators), (*Magnetohydronamics, Particle accelerators), (*Plasma engines, Performance (Engineering)), Plasma jets, Thrust, Electric arcs, Magnetic fields, Electric arcs, Magnetic fields, Electric currents, Voltage, Propellants, Hydrogen, Nitrogen, Argon, Ammonia, Plasma oscillations, Heat exchangers, Thermodynamics.

The magnetic annular arc (MAARC) is an axisymmetric Hall current plasma accelerator. Data is presented which were obtained with various propellants for input powers ranging between 10 and 100 kW. Between specific impulses of 3000 sec and 4000 sec, thrust efficiencies in excess of 50% have been achieved. The current-voltage characteristics of the magnetic annular arc are established and a qualitative explanation of their nature is presented. The overall arc voltage is shown to be a unique function of the applied bias magnetic field strength for a given propellant and magnetic field geometry. A partial theory for this effect is developed. The functional dependence of the thrust on applied bias magnetic field strength and geometry at constant input power and propellant mass flow rate is described. Data is presented on thermal efficiency obtained from heat balances and estimates are made of the value of omega x tau and the effect of ion slip in this device. (Author)

AD-613 689 Div. 27, 9, 12
CFSTI Prices: HC$2.00 MF$0.50

Lockheed Missiles and Space Co., Sunnyvale, Calif.
SECONDARY INJECTION THRUST VECTOR CONTROL,
by C. A. Zimmerman, D. Starrett, and J. M. Vellinga.
1964, 28p
Unclassified report

Descriptors: (*Secondary injection, Thrust vector control systems), (*Thrust vector control systems, Secondary injection), (*Rocket motor nozzles, Thrust vector control systems), Shock waves, Perturbation theory, Supersonic nozzles, Heat transfer, Blunt bodies, Correlation techniques, Experimental data, Theory.

On the basis of experimentally acquired data, thrust vector control systems utilizing secondary injection of fluids into supersonic nozzles have been developed. Several widely divergent theoretical and analytical treatments of the phenomena have appeared as new applications were proposed. The paper reviews the several theories and attempts correlation with the experimental data. Secondary injection thrust vector control results from the injection of fluid (gas or liquid) into the primary exhaust stream of the rocket motor through ports in the divergent section of the nozzle. A shock is induced resulting in a pressure unbalance in the exit cone. The resultant side force, controllable in magnitude and direction, can be utilized for precise vehicle control. (Author)

28. Psychology and Human Engineering

AD-613 180 Div. 28, 30
CFSTI Prices: HC$6.00 MF$1.25

Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PREDECISIONAL PROCESSES IN DECISION MAKING: PROCEEDINGS OF A SYMPOSIUM,
ed. by Darwin P. Hunt and Donald L. Zink.
Dec 64, 206p AMRL-TDR-64-77
Proj. 7183, Task 718303

Unclassified report

Symposium was held at Wright-Patterson Air Force Base in Apr 1962.

Descriptors: (*Decision making, Symposia), Optimization, Motivation, Game theory, Decision theory, Behavior, Probability, Distribution, Psychophysiology, Communication theory, Performance (Human), Reasoning, Human engineering.

Contents (Predecisional processes are characterized as the search for, acquisition of, and evaluation of information prior to choice of a course of action):
Information seeking to reduce the risk of decision, by Ward Edwards, with discussion led by Emir Shuford
Belief states, evidence, and action, by Thornton B. Roby, with discussion led by Masanao Toda
Predecisional processes related to psychophysical judgment, by Emir H. Shuford, with discussion led by Thornton B. Roby
Pre- and postdecisional processes of the 'Fungus-Eater', by Masanao Toda, with discussion led by Ward Edwards
Attention, curiosity, and decision, by Daniel E. Berlyne, with discussion led by John T. Lanzetta
Predecisional information processes: some determinants of information acquisition prior to decision making, by John T. Lanzetta and Joan Sieber, with discussion led by Janellen Huttenlocher
Some neglected variables in contemporary conceptions of decision and performance, by John W. Atkinson and Dorwin P. Cartwright, with discussion led by Daniel E. Berlyne.

AD-613 344 Div. 28, 1
CFSTI Prices: HC$3.00 MF$0.75

Douglas Aircraft Co., Inc., Long Beach, Calif.
AN INVESTIGATION OF LIGHTING IN DISPLAYS WITH SUPERIMPOSED FIELDS WHILE AT LOW LEVELS OF ILLUMINATION,
by Richard F. Gabriel, Leon R. Uyeda, and Alan A. Burrows. Feb 65, 61p
Contract Nonr434800, Proj. NR196 038

Unclassified report

Descriptors: (*Display systems, Illumination), (*Lighting equipment, Human engineering), (*Visual perception, Performance (Human)), Light, Colors, Performance tests, Tracking, Adaptation (Physiology).

One type of 'heads-up' display involves the projection, collimation, and reflection of display information from the aircraft windshield in front of the pilot. This type of display may interact with the pilot's visual capability at low levels of illumination. A study was performed to determine which of several alternate lighting configurations resulted in the best dual field performance. Both red and white light were used. The concept of pulsed or intermittent lighting was investigated as well. A three-dimensional factorial experimental design allowed the simultaneous evaluation of the intermittency variables as well as the lighting variable. The task involved performing a continuous compensatory tracking task while simultaneously performing an alphanumeric detection-recognition task on moving elements. Results supported the use of white light. Pulsed white light at a high light-dark ratio and high interruption frequency resulted in performance on a level with that obtained with continuous white light and superior in every instance to that obtained with red light. (Author)

AD-613 475 Div. 28, 23
CFSTI Prices: HC$1.00 MF$0.50

Vanderbilt Univ., Nashville, Tenn.
STUDIES IN ABSTRACTION LEARNING, TRANSFER LEARNING, INSTRUCTIONAL PROBLEMS OF TEACHING, AND BEHAVIORAL PROCESSES,
Final rept. for 15 Apr 56-30 Jun 64,
by Leland E. Thune. Jun 64, 4p
Contract NONR214901

Unclassified report

Descriptors: (*Learning, Bibliographies), (*Transfer of training, Bibliographies), (*Education, Applied psychology), Effectiveness, Reasoning, Retention, Perception (Psychology).

A bibliography of 12 references is given.

AD-613 482 Div. 28
CFSTI Prices: HC$1.00 MF$0.50

Institute of Behavioral Research, Texas Christian Univ., Fort Worth,
DIMENSIONS OF STIMULUS SITUATIONS WHICH ACCOUNT FOR BEHAVIOR VARIANCE.
Quarterly status rept.,
by S. B. Sells. 1 Apr 65, 2p
Contract Nonr343600

Unclassified report

Descriptors: (*Behavior, Ecology), (*Social psychology, Behavior), Psychophysiology, Stress (Psychology), Analysis of variance.

The broad objective of the program involves the identification, quantification, and taxonomic classification of environmental variables, social and physical, that account for variance in behavior. Two related objectives include (a) analysis of stress mechanisms and environmental stress in this broad framework, and (b) a study of employment factors and conditions on attitudes of psychologists. Research progress is reported.

AD-613 513 Div. 28

Waterloo Univ. (Ontario).
INFLUENCE OF RESPONSE CONSEQUENCES TO A SOCIAL MODEL ON RESISTANCE TO DEVIATION,
by Richard H. Walters and Ross D. Parke. 1964, 12p
Grants PHR G605 5 293, DRB9401 24

Unclassified report

Pub. in Journal of Experimental Child Psychology (U.S.) v1 n3 p269-80 Oct 1964
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Behavior, Social psychology), (*Children, Social psychology), Reaction (Psychology), Motivation, Group dynamics, Motion pictures, Canada.

In a study of the influence of films showing response consequences to a model for resistance to deviation, children were assigned to one of four conditions: film model rewarded for deviation; model punished; no consequence to model; and no film. They were then tested in a 'temptation' situation. As predicted, children under the model-rewarded and no-consequence conditions deviated relatively readily. In contrast, children in the model-punished and no-film groups deviated very little. However, when the prohibition on the deviant behavior was removed, children who had seen the model punished imitated the model's behavior to as great an extent as the other children who had witnessed the model's deviation. (Author)

AD-613 532 Div. 28
CFSTI Prices: HC$2.00 MF$0.50

Tufts Univ., Medford, Mass.
PROCEDURAL CONSTRAINT AND TASK PERFORMANCE,
by Thornton B. Roby and Susan Goldberg. Nov 64, 48p
Contract AF19 628 2450, Proj. 7682, Task 768203
ESD TR-64-663
Unclassified report

Descriptors: (*Decision making, Performance tests), (*Behavior, Control), Performance (Human), Visibility, Probability, Analysis of variance, Tables.

Persons or groups assigned to certain tasks are typically required to follow institutionally originated rules of action or constraints that limit the range of their task behavior. Ordinarily these procedural rules are based on general experience with the task situation and are designed to guard against serious errors: however they have the secondary effect of reducing the potential for superior enterprise or discretion on the part of the performing agent. The question of practical importance concerns the specific conditions that militate in favor of either increased or decreased superordinate control. The purpose of the investigation is to develop a laboratory methodology for studying this problem. The general task condition used was an abstract maze in which subjects had to select a path between designated points. An attempt was made to produce experimental analogues of 'visibility,' or task information accessible to the subject, and environmental 'bias,' or general favorability for exploratory behavior. (Author)

AD-613 580 Div. 28
CFSTI Prices: HC$1.00 MF$0.50

Group Effectiveness Research Lab., Univ. of Illinois, Urbana,
INTERPERSONAL PERCEPTION AND PSYCHOLOGICAL ADJUSTMENT OF GROUP MEMBERS,
Annual rept.,
by Fred E. Fiedler. Jan 65, 10p
Contract DA49 193MD2060
Unclassified report

Descriptors: (*Group dynamics, Effectiveness), (*Adjustment (Psychology), Group dynamics), (*Perception (Psychology), Group dynamics), Social psychology, Projective techniques, Sociometrics.

Progress is reported on psychological studies, including the following topics: quasi-therapeutic effects of intergroup competition, quasi-therapeutic team relations in a training regiment, quasi-therapeutic effects of health-engendering roommates and dormitory counselors.

AD-613 581 Div. 28

Baylor Univ., Houston, Tex. Coll. of Medicine.
RIGHT-LEFT GRADIENTS IN BODY IMAGE, BODY REACTIVITY, AND PERCEPTION,
by Seymour Fisher. 1959, 85p
Contract AF18 603 79
AFOSR TN-58-1029
Unclassified report

Available only for reference use at DDC Field Services. Copy is not available for public sale.
Prepared in cooperation with Houston State Psychiatric Inst., Tex.

Descriptors: (*Perception (Psychology), Body), (*Body, Perception (Psychology)), (*Personality, Perception (Psychology)), Attitudes, Behavior, Galvanic skin response, Adjustment (Psychology), Reaction (Psychology), Projective techniques, Distortion, Anxiety, Sex, Statistical tests, Correlation techniques.

The main purposes of this study were (1) to cross-validate and extend previous findings which indicate that an individual's attitudes toward the right vs. left sides of his body play a part in determining the relative GSR reactivity of the two sides; (2) to establish more clearly the relationship between modes of right-left body image and body reactivity differentiation and patterns of sex role identification; (3) to ascertain whether there are links between modes of right-left body image and body reactivity differentiation and indices relating to the individual's maturity, and his freedom to formulate aggressive fantasy; and (4) to investigate the relationships between right-left bias in perception and patterns of right-left differentiation in body image and body reactivity. These goals were pursued by studying 36 men and 42 women with a battery which embraced a wide variety of body image, body reactivity, perceptual, and personality measures. In general, it was demonstrated that there are meaningful relationships between right-left gradients in body image, body reactivity, and perception. The findings are supportive of the position that body image attitudes play a part not only in body reactivity patterns but also in perceptual directionalities. (Author)

AD-613 612 Div. 28, 1
CFSTI Prices: HC$3.00 MF$0.75

Bunker-Ramo Corp., Canoga Park, Calif.
A STATIC INVESTIGATION OF SELECTED SCALE CHARACTERISTICS FOR MOVING-TAPE INSTRUMENTS,
by Barbara J. Kelso. Oct 64, 57p
Rept. no. CDIC-1241
Contract AF33 657 8600, Proj. 6190, Task 619007
Unclassified report

Rept. on USAF Control-Display Program.
Prepared in cooperation with Link Div., General Precision, Inc., Palo Alto, Calif., Contract AF33 657 8021.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC.
Copy is available for public sale.

Descriptors: (*Display systems, Human engineering), (*Tapes, Calibration), Flight instruments, Positioning reactions, Reaction (Psychology), Reading, Scale, Analysis of variance, Factor analysis, Reflexes, Verbal behavior, Errors, Tables, Motion, Training devices.

An experiment was conducted to investigate the effects of scale factors, graduation marks, orientation of scales and factors of 10 reading conditions on moving-tape instruments. Subjects consisted of 150 Air Force officers. A five dimensional partial hierachal model was employed with subjects nesting within graduation mark-factors of 10 combinations. Each subject made a total of 150 self-paced readings from slides of hand drawn instrument-like scales with a fixed read line indicator. Legibility was determined in terms of subjects' speed and accuracy in reading the scales. Error was expressed as the magnitude of deviation of a subjects' verbal response from the set scale value. An analysis of variance was performed on the mean error scores, standard deviations of error, mean reaction times, and standard deviations of reaction times. Where significant differences were noted, the nature of these differences was examined by the Newman-Keuls method. The results clearly favored the 1-7/8 inch scale factor over the 1-3/8 inch and the 2-3/8 inch scale factor. The use of 9 graduation marks was superior to either 0, 1, 3 or 4 graduation scales read by 10 or by 1000. Horizontal scales were read more rapidly but no more accurately than vertical scales. (Author)

AD-613 620 Div. 28, 25, 32, 33
CFSTI Prices: HC$3.00 MF$0.75

National Opinion Research Center, New York.
COMMUNITY REACTIONS TO SONIC BOOMS IN THE OKLAHOMA CITY AREA.
Final rept. for Apr 63-Feb 65,
by Paul N. Borsky. Feb 65, 61p Rept. no. 101
Contract AF33 657 11148, Proj. 7231, Task 723103
AMRL TR-65-37
Unclassified report

Descriptors: (*Sonic boom, Oklahoma), (*Reaction (Psychology), Sonic boom), (*Air transportation, Oklahoma), Supersonic planes, Transport planes, Public opinion, Acoustics.

The Oklahoma City, Oklahoma, area was repeatedly exposed to sonic booms generated by a simulated schedule of supersonic transport overflights during a period of 6 months from February to July 1964. The schedule provided for eight sonic booms per day programed at an intensity of 1.5 pounds per square foot (PSF) during the first portion of the study and 2.0 PSF during the latter stages. Almost 3000 local residents were personally interviewed three times during the 6-month period to determine the nature and extent of their reactions to the sonic booms. Among the findings it was shown that substantial numbers of residents reported interruptions of ordinary living activities, and some annoyance with these interruptions, however, the overwhelming majority felt they could learn to live with the numbers and kinds of booms experienced during the 6-month study. (Author)

AD-613 683 Div. 28
CFSTI Prices: HC$2.00 MF$0.50

Colorado Univ., Boulder.
REACTIONS TO POSITIVE AND NEGATIVE INFORMATION ABOUT THE SELF AS A FUNCTION OF CERTAIN PERSONALITY CHARACTERISTICS OF THE RECIPIENT.
Master's thesis,
by Donald C. Van Ostrand. 1964, 40p
Technical rept. no. TR-12
Contract Nonr114707
Unclassified report

Descriptors: (*Attitudes, Personality), (*Personality, Adjustment (Psychology)), Perception (Psychology), Social psychology, Reaction (Psychology), Social communication, Psychometrics.

The present study is designed to investigate a variety of adjustive processes resulting from the receipt of discrepant ratings from a friend concerning a set of personal characteristics known to be important to the subject group. Indices of both affective arousal and cognitive resolutions to such discrepancies are compared for groups at three levels of self-esteem. The research is partly a replication of the studies by Harvey, Kelley, and Shapiro (J. Pers., 1957, 25: 393-411), and Harvey (ONR Technical Report No. 8, Contract 2149(02), 1958), where discrepant information given to the subjects was negative in relation to the subjects' own self-perceptions. The use of positive information also, in two experimental conditions of the present study, is in certain respects similar to the study by Harvey and Clapp (Hope, expectancy, and reactions to be expected, in press, 1964) conducted subsequent to the present one. In presenting individuals at varying levels of self-esteem with discrepant evaluations of themselves, the intent of this study is mainly to further the process of description of cognitive-affective responses to discrepant inputs. While the nature of such discrepancies is handled within a theoretical model, there is no attempt to state a more comprehensive theory of self-esteem. (Author)

AD-613 729 Div. 28

Oxford Univ. (England).
OVERTRAINING AND TRANSFER WITHIN AND BETWEEN DIMENSIONS IN THE RAT,
by N. J. Mackintosh. 3 Dec 62, 8p
Contract N62558 2453
Unclassified report

Pub. in Quarterly Journal of Experimental Psychology (Gt. Brit.) v16 pt3 p250-6 Aug 1964 (Copies available only to DDC users).

Descriptors: (*Transfer of training, Rats), (*Learning, Rats), Conditioned reflex, Stimulation, Brightness, Performance tests, Analysis of variance, Great Britain.

Although reversal learning in the rat is normally assisted by overtraining, it seems that transfer to a new discrimination in a different stimulus dimension is not. This effect is confirmed in the present experiment, even though the stimuli of the second problem had been present (and necessarily attended to) in the first problem. This result is taken to show that the effects of overtraining cannot be accounted for by supposing that it strengthens an overt orienting response of the animal. A second group of rats was run to show that transfer to a second discrimination problem within the same dimension as the first is facilitated by overtraining. The important variable, therefore, that determines the direction of the effect of overtraining on transfer between problems, is the relationship between the stimulus dimensions concerned. (Author)

AD-613 782 Div. 28

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE EFFECT OF SYSTEMATIC AND NONSYSTEMATIC PRESENTATION OF STIMULI ON PERIPHERAL VISUAL ACUITY,
by Harry W. Karn, Lee W. Gregg, and Gordon F. Pitz.
14 Feb 62, 7p
Contract AF49 638 770
AFOSR 2549
Unclassified report
Pub. in Journal of Psychology (U. S.) v53 p491-7 1962.
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Visual acuity, Performance (Human)), (*Perception (Psychology), Visual acuity), Visual perception, Learning, Stimulation, Attention, Retina, Vision, Errors, Analysis of variance.

The results of the present investigation, which show an increase in visual acuity with an increase in exposure time, corroborate the findings of previous investigators who have treated the acuity response as a purely retinal event governed by such factors as intensity and duration. The findings demonstrate a differential effect of exposure time on peripheral visual acuity as the result of a systematic and nonsystematic presentation of the stimuli. Significantly more errors occur under conditions of nonsystematic presentation when exposure times are .1 and .2 seconds; with exposure times of .5 and 1 seconds these differences disappear. Apparently, prior knowledge of where the stimulus will appear elicits behavior which enables S to improve the accuracy of his perceptual response. (Author)

AD-613 799 Div. 28

Wisconsin Univ., Madison.
THE MAKE A SENTENCE TEST (MAST): A REPLICATION STUDY,
by Edgar F. Borgatta. 19 Jan 60, 24p
Contract AF49 638 195
AFOSR TN-60-46

Unclassified report

Pub. in Journal of General Psychology (U. S.) v65 p269-92 1961 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Test construction (Psychology), Personality), (*Personality, Psychometrics), Group dynamics, Reaction (Psychology), Mental disorders, Abnormal psychology, Projective techniques, Males, Females, Correlation techniques, Analysis of variance.

The analysis was designed to include what would be considered to be a high variance sample of subjects. Such subjects were drawn from several institutional sources and included prisoners and mental patients of various categories. The analysis has presented the data for the total sample and five subsamples in order to allow examination of the consistencies and inconsistencies that occur with such small samples. Comparing the male and female data allows one examination of consistency; comparing the prisoners with mental patients allows another. When this analysis is compared to the previous report of college samples, there is considerable consistency of definition of the MAST variables in terms of the personality inventory data to which the MAST variables are correlated. Some differences would be expected on the basis of sampling along, but other differences would be expected on the basis of such pervasive variables as age and educational differences, and other selective biases in choosing samples of unique characteristics. The definition of the following MAST variables appears to be relatively consistent from the college student sample to the high variance sample: MAST 1 Paranoid, MAST 2 Hostile, MAST 5, Conventional, MAST 7 Depressive (for the GZ), and MAST 11 Optimistic. (Author)

AD-613 810 Div. 28

Miami Univ., Oxford, Ohio.
SEX DIFFERENCES AND THE MAS.
Final rept. for Apri-Jul 62,
by John C. Jahnke, Clarke W. Crannell, and Julian O. Morrissette. Jul 64, 8p
Contract AF33 616 7132, Proj. 7184, Task 718403
AMRL TR-65-14

Unclassified report

Pub. in Educational and Psychological Measurement (U. S.) v24 n2 p309-12 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Anxiety, Psychometrics), Males, Females, Sex, Personality.

In administering the Taylor Manifest Anxiety Scale (MAS) to introductory psychology students over a 2-year period (1180 M, 678 F), the results obtained were consistent with those of other investigators; namely, F score higher than M. This result may reflect either a true cultural bias and/or a sex bias in items of the MAS. An item analysis performed on a sample of 400 randomly drawn from the 1858 Ss tested, showed 13 of the 50 items of the MAS with a significant sex bias. 7 of the 13 biased items were biased toward higher scores for M. 24 of the remaining (37) items were biased (nonsignificantly) toward higher scores for F. Two conclusions may be drawn: (1) sex differences in the 50-item MAS are apparently not attributable to significant sex biased items; (2) the consistent sex differences on the MAS suggest caution in the use of the scale in selecting M and F Ss for experiments. (Author)

AD-613 843 Div. 28

Institute for Psychological Research, Tufts Univ., Medford, Mass.
BEHAVIORAL FREEDOM AND CONSTRAINT,
by Thornton B. Roby. 1963, 23p
Contract AF19 604 5727
ESD TDR-63-547

Unclassified report

Pub. in Journal of Psychological Studies (U. S.) v14 n2 p49-69 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Behavior, Social psychology), Personality, Decision making, Probability, Motivation, Performance (Human), Adjustment (Psychology), Measurement.

The topic of behavioral freedom is surveyed with attention to aspects of the problem that may be treated by recently developed conceptual and empirical techniques. It is suggested that the application of information theory concepts to the measurement of observed behavioral variability provides a useful framework for quantification. Various difficulties and hazards of this approach are pointed out and tentative solutions are submitted. It is also proposed that the notion of uncertainty is relevant to the analysis of subjective freedom if the latter is interpreted as perceived elbow room to deal with future contingencies. A typology of behavioral constraints is outlined with emphasis being placed on the distinction between cross-sectional and diachronic constraints. Finally, several special problems are singled out which seem to be directly amenable to experimental study. (Author)

29. Quartermaster Equipment and Supplies

AD-613 189 Div. 29, 23
CFSTI Prices: HC$1.00 MF$0.50

Army Research Inst. of Environmental Medicine, Natick, Mass.
THE ARCTIC SOLDIER: POSSIBLE RESEARCH SOLUTIONS FOR HIS PROTECTION, Unclassified report
by Ralph F. Goldman. 1964, 22p

Descriptors: (*Army personnel, Arctic regions), (*Arctic regions, Army personnel), (*Protective clothing, Army personnel), (*Acclimatization, Army personnel), Scientific research, Shelters, Heating, Feet, Hands, Climate, Exposure suits, Heat production (Biology), Gloves, Shoes.

The results are summarized of a research program on auxiliary heating with minimum power. The program established the feasibility of 2 approaches: auxiliary heating for the extremeties of the body and a conditioned air-clothing system that probably has primary application in hot and/or toxic environments but could handle cold easily. Protection of the inactive soldier in extremely cold environments was resolved in terms of the parameters of weight and cost. A 7-lb prototype system was adequate to meet military characteristics of providing 8 hours of protection for the inactive man at -40 degrees F with a 3 mile/hour wind. Improvement in the weight factor can be anticipated as power source development improves over the current 16 watt-hours/pound. A more immediate use of auxiliary heated handware and footware is in areas where power is available such as military vehicles, radio and radar equipment, and missiles. The auxiliary heating system developed is compatible with a 12- or 24-v AC or DC power source.

AD-613 325 Div. 29, 16, 20
CFSTI Prices: HC$5.00 MF$1.25

Army Natick Labs., Mass.
RADIATION PRESERVATION OF FOODS PROGRAM. PROCEEDINGS OF CONTRACTORS' MEETING (8th) U. S. ARMY NATICK LABORATORIES NATICK, MASSACHUSETTS OCTOBER 7-9, 1963,
ed. by Frank R. Fisher and Edward S. Josephson.
1964, 196p
PB 166 166 Unclassified report

Descriptors: (*Irradiated foods, Symposia), (*Food, Preservation), (*Radiation effects, Food), Research program administration, History, Nutrition, Microbiology, Economics, Biochemistry, Acceptability, Packaging, Dosimeters, Radiological dosage, Accelerators, Reports.

Contents include reports on the following: Army radiation preservation of foods programs: historic highlights, present and future; AEC program; Product development; Wholesomeness, nutritional adequacy, and microbiology; Development of radiation facilities; Economic aspects and prospects of commercialization of radiation pasteurized foods; Wholesomeness of foods preserved by cold-sterilization and induced radioactivity; Present status of the wholesomeness program; Biochemical aspects of food radiation; Radiation microbiology program philosophy, principles, and objectives; Radiation microbiology program progress report; Troop acceptance tests of irradiated foods; Packaging for radiation sterilized foods; Dosimetry and dose distribution; Accelerators for food preservation.

AD-613 349 Div. 29
CFSTI Prices: HC$2.00 MF$0.50

Swift and Co., Chicago, Ill. Research Labs.
DEVELOPMENT OF READY-TO-EAT RATION TYPE BEEF ITEMS.
Rept. for Sep 61-Sep 63,
by F. L. Kauffman and J. W. Harlan. Feb 65, 29p
Technical rept. no. FD-5
Contract DA19 129QM1897, Proj. 7 84 01 002
Unclassified report

Descriptors: (*Beef, Preparation), (*Military rations, Beef), Taste, Irradiated foods, Condiments, Peptides, Enzymes, Heating, Storage, Stability.

Beef cooked in barbecue sauce, beef sauce or mushroom sauce had reduced irradiation flavor compared to untreated controls and had a fair acceptability in consumer tests. Some spices added to beef resulted in a product having a lower over-all irradiation flavor, but no spice was found that was satisfactory. Protein hydrolysates pumped into the beef before slicing also lowered ultimate irradiation flavor. Beef must be enzyme-inactivated in order to make it shelf-stable. This enzyme inactivation has been done by heating to 77C and results in a partially cooked product. When it is reheated prior to serving it has a 'warmed over' flavor that is not desirable. To improve this aspect of beef steak quality, steak preparation methods were evaluated based on lower temperatures for longer times. It was found that steaks heat-enzyme-inactivated at 65C and 50% relative humidity for 15 minutes, or at 57C and 90% relative humidity for 60 minutes, had a greatly reduced 'warmed over' flavor. (Author)

AD-613 597 Div. 29, 28
CFSTI Prices: HC$1.00 MF$0.50

Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
A COMPARISON OF THREE FULL-PRESSURE SUITS IN TERMS OF CONTROL ACTIVATION TIME.
Final rept. for Nov 63-Feb 64,
by Earl D. Sharp. Dec 64, 22p AMRL TR-64-126
Proj. 7184, Task 718402
Unclassified report

Descriptors: (*Pressure suits, Maneuverability), (*Astronauts, Positioning reactions), Human engineering, Motion, Instrumentation, Time studies, Control knobs, Toggle switches, Simulation.

Three pressure suits, both pressurized and unpressurized, were compared on the basis of times taken by two subjects to initiate action and to reach to and operate controls located in various positions in a simulated workspace. The suits compared were the Apollo Phase B, the Gemini G2C-1, and the Apollo 1960 State-of-the-Art. The controls used were knobs, toggle switches, and pushbuttons. The work area investigated was semicircular, extending left and right 78 degrees, 34 to 49 inches above the floor, at a distance of approximately 2 feet. Average times for each combination of suit, suit condition (pressurized or unpressurized), control type, control location, and hand used are presented. No suit appeared to be unequivocally superior. Total time to initiate action and to reach to and operate toggle switches and pushbuttons was typically, although not universally, shorter when wearing the Apollo 1960 State-of-the-Art suit. Total time to initiate action and to reach to and operate knobs was typically, although not universally, shorter when wearing the Gemini G2C-1 suit; however, not all locations could be reached when wearing this suit. (Author)

30. Research and Research Equipment

AD-613 163 Div. 30
CFSTI Prices: HC$2.00 MF$0.50

Frankford Arsenal, Philadelphia, Pa. Research and Development Directorate.
DEVELOPMENT OF A PARALLEL OUTPUT PRINTER FOR THE FADAC COMPUTER,
Interim rept.,
by Robert F. Munnich. Dec 64, 47p
Memo rept. no. M65-10-1
Proj. 1W542709D36108

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Input-output devices, Design), (*Typewriters, Computers), Computer logic, Circuits, Wiring diagrams, Programming (Computers), Operation.

This report contains a description of the functions and design details of the FADAC Output Typewriter (FADOT), which was fabricated specifically for laboratory use with the FADAC computer. The machine consists of a modified IBM Selectric input/output typewriter and interface electronics. Logic, circuitry and operation details are provided. (Author)

AD-613 165 Div. 30
CFSTI Prices: HC$2.00 MF$0.50

Harry Diamond Labs., Washington, D. C.
CIRCUIT REALIZATION OF A SQUARE ROOT SUM OF SQUARES COMPUTER,
by Ira R. Marcus, Joseph W. Miller, Jr., and Albert J. Buschman, Jr. 25 Jan 65, 41p
Rept. no. TR-1271
Proj. 45900

Unclassified report

Descriptors: (*Computer logic, Correlation techniques), (*Correlation techniques, Computer logic), Accelerometers, Spacecraft, Space probes, Telemetering data, Data processing systems, Computers.

An electronic system was developed to compute the square root of the sum of the squares for three input variables. The basic technique was to use a conventional triaxial accelerometer and to process the three input signals, giving as an output one waveform. This report covers specifically the design and evaluation of circuitry that (1) accepts input signals from the accelerometers during impact, and (2) computes an instantaneous magnitude of the acceleration-time curve continuously. The circuitry was determined operable over a dynamic range of 4 mv to 4 v, with a frequency response of 4 to over 4000 cps. A computational accuracy of within 5 percent has also been proved between 50 mv and 4 v; an accuracy to within 10 percent has been proved from 4 to 50 mv. (Author)

AD-613 173 Div. 30
CFSTI Prices: HC$1.00 MF$0.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
ELECTRIC WIND TUNNEL AIR HEATER, PREFERABLY OF GREATER SUPERSONIC SPEED WIND TUNNELS,
by A. Ts. Bosis, A. L. Iskra, and S. S. Ustinov.
18 Mar 65, 5p FTD-TT-64-1084
TT 65-61862

Unclassified report

Unedited rough draft trans. of Russian patent 119364, appl. 607734/27, 16 Sep 58.

Descriptors: (*Wind tunnels, Heaters), (*Heaters, Patents), Wind tunnel nozzles, Heating elements, Resistance (Electrical), Supersonic wind tunnels, Design, USSR.

The invention consists of an electric air heater for a wind tunnel, preferably of greater supersonic velocities, to assure uniform field of temperatures of the air entering the nozzle of the tunnel. A rectifying tunnel grid, made of a material with greater ohmic resistance, was used in place of electric resistance elements of the heater.

AD-613 177 Div. 30, 16, 28
CFSTI Prices: HC$1.00 MF$0.50

Harvard Univ., Boston, Mass. Medical School.
AUTOMATIC DATA PROCESSING IN PSYCHOPHYSIOLOGY: A SYSTEM IN OPERATION,
by Bernard Tursky, David Shapiro, and P. Herbert Leiderman. Feb 65, 21p Technical rept. no. TR-11
Contract Nonr186643, Proj. NR170 518

Unclassified report

Descriptors: (*Data processing systems, Psychophysiology), (*Psychophysiology, Data processing systems), Physiology, Data, Magnetic tape, Analog-to-digital converters, Automatic, Bandwidth, Programming (Computers), Sampling, Stability, Data storage systems.

An automatic system for processing physiological data is described. Through the use of this system and proper programming, the complex and varied data processing problems of psychophysiological research can be handled appropriately and with relative ease. The system has the following advantages: (1) The data are stored in dynamic form for easy retrieval. (2) The flexible sampling arrangement meets the needs of psychophysiological experiments independent of their time course. (3) The output is in a format compatible with high-speed computing facilities.

AD-613 179 Div. 30, 2, 16, 27
CFSTI Prices: HC$6.00 MF$1.50

Foreign Tech. Div., Air Force Systems Command, Wright-Patterson AFB, Ohio.
COSMIC RESEARCH, 1965, VOL. 3, NO. 2.
1 Apr 65, 290p FTD-TT-65-170
TT 65-61866

Unclassified report

Unedited rough draft trans. of Kosmicheskie Issledovaniya (USSR) 1965, v. 3, no. 2, p. 3-174.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Atmospheric sounding, Reports), (*Space biology, USSR), (*Celestial mechanics, Numerical methods and procedures), (*Measuring devices (Electrical and Electronic), Atmospheric sounding), Astronautics, Sounding rockets, Scientific satellites, Electron multipliers, Electron density, Chemical reactions, Space medicine, Radiobiology, Space propulsion.

Contents: Linearized theory of optimal multi-impulse coplanar transfer; The asymptotics of equations of celestial mechanics suitable for a wide range of change in eccentricity; Investigation of the ionosphere with rockets and satellites; Measurement of soft-electron fluxes in the upper atmosphere using a secondary-electron multiplier; Measurement of intensity and spectrum of soft electron flux in the ionosphere at altitudes of 200-500 km; An electrostatic fluxmeter designed for measurement in the upper layers of the atmosphere; Some results from the determination of the geographic distribution of currents of ascending thermal radiation from the ground and the atmosphere for specific synoptic situations; The electron intensity of the radiation belts at altitudes of 180-330 km in regions conjugate with negative geomagnetic anomalies; Heterogeneous recombination of atomic gases. Reaction of hydrogen atoms with the surface of molybdenum; Investigation of movement coordination when writing under conditions of space flight; Reaction of irradiated organism when affected by acceleration of critical magnitude; The plasma laser as a photon-rocket engine; Direct measurements of charged-particle concentration in the stratosphere and mesosphere; A transistorized electrometric amplifier for measuring weak currents from charged-particle detectors.

AD-613 198 Div. 30, 1, 9
CFSTI Prices: HC$3.00 MF$0.75

LTV Vought Aeronautics Div., Ling-Temco-Vought, Inc., Dallas, Tex.
ANALYSIS OF A LOW SPEED WIND TUNNEL TEST OF A HIGH MASS RATE VECTORED PROPULSION FLOW MODEL,
by R. T. Stancil and L. J. Mertaugh, Jr. 15 Feb 65, 97p Rept. no. 2-53310/4R-2166
Contract DA31 124ARO D262, Proj. 5260E
AROD 5260:2 Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. A copy is available for Public sale.

Descriptors: (*Wind tunnel models, Vertical take-off planes), (*Vertical take-off planes, Wind tunnel models), Aerodynamic configurations, Lift, Drag, Thrust, Force (Mechanics), Flow visualization, Exhaust gases, Propulsion, Wings, Jet flaps, Tails (Aircraft), Model tests, Graphics.

An analysis of selected portions of the data resulting from a low speed wind tunnel test of a semi-span model of a VTOL aircraft is presented. The model features an integrated propulsion/lifting surface system as well as a horizontal tail located on an aft, wing tip extension. The propulsion system flow, simulated with cold air, exhausts over the wing trailing edge flap (flap jet) and out of the lower surface of the wing (wing box jet). The exhaust flows can be independently vectored through 90 degrees. Force and moment data are presented for both static and forward flight conditions. Some comparison with theoretical predictions are presented. Portions of the data are shown with the direct thrust components removed. The results of this analysis show that: (1) the outboard location of the horizontal tail provides a reduction in airplane induced drag, (2) a significant portion of the theoretical jet flap effect is obtained with the wing box jet directed parallel to the wing chord plane, (3) a reduced jet flap effect is available with deflections of the wing box jet away from the wing chord plane, and (4) further testing is desirable for a better understanding of the characteristics of this configuration. (Author)

AD-613 276 Div. 30, 16, 25
CFSTI Prices: HC$2.00 MF$0.50

Operations Research Center, Univ. of Calif., Berkeley.
AN INVESTIGATION OF THE BURN-IN AND RELATED PROBLEMS,
Technical rept.,
by Michael J. Lawrence. Nov 64, 32p
ORC-64-32(RR)
Contract Nonr365618
Unclassified report

Descriptors: (*Semiconductors, Life expectancy), (*Operations research, Failure (Mechanics)), (*Life span, Mathematical models), Distribution theory, Reliability, Probability, Medical research.

Two problems involving the derivation of bounds on distributions with a decreasing failure rate (DFR distributions) are presented. Given that an item has a decreasing failure rate, sharp upper and lower bounds on the burn-in time to achieve a specified mean residual life are derived. The bounds rely only on the DFR assumption and knowledge of the first moment and a percentile of the failure distribution. An early estimate of the five year survival proportion (commonly called the five year cure rate) is of great interest in assessing the value of a treatment for a mortal disease such as cancer. Assuming that the distribution of time to death is DFR and assuming a knowledge of the mean and a percentile, sharp upper and lower bounds on the survival proportion are obtained. In addition some bounds on the hazard rate and density of a DFR distribution are given. (Author)

AD-613 277 Div. 30
CFSTI Prices: HC$3.00 MF$0.75

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
GYRO TORQUE DUE TO MAGNETIC ATTRACTION BETWEEN FLEX LEADS.
Revised ed.,
by Lawrence Sher. Jan 65, 58p E-1706
Contract AF33 615 2243, Proj. 52 231
Unclassified report

Revision of rept. dated Mar 63.

Descriptors: (*Gyroscopes, Torque), (*Electric connectors, Torque), Engines and motors, Electric currents, Magnetic fields, Mathematical analysis, Configuration, Programming (Computers).

The steady-state torque exerted on a gyroscope float due to the magnetic interaction of the motor excitation currents flowing through the flex leads is computed. The analysis is performed for two different configurations of flex leads. (Author)

AD-613 284 Div. 30, 32
CFSTI Prices: HC$2.00 MF$0.50

System Development Corp., Santa Monica, Calif.
SPAN REFERENCE MANUAL. SPAN SYSTEM OPERATION,
by Vladimir V. Almendinger. 28 Feb 65, 33p
Rept. no. TM-1563/010/01
Contract CPR11 1543
Unclassified report

Descriptors: (*Data processing systems, Programming(Computers)), (*Urban areas, Statistical analysis), Management control systems, Programming languages, Control sequences, Data storage systems, Analysis of variance, Social sciences, Computers, Specifications.

The document is one of a series of volumes of the SPAN Reference Manual describing the SPAN system for data management and statistical analysis. The SPAN system provides an integrated file processing and multivariate

analysis capability for problems involving large data matrices with large numbers of variables. The system is oriented to problems of social science in general and urban data analysis in particular. This volume provides information required by the user for the running of the system on an IBM 7090 or 7094 computer. (Author)

AD-613 285 Div. 30, 32
CFSTI Prices: HC$2.00 MF$0.50

System Development Corp., Santa Monica, Calif.
SPAN REFERENCE MANUAL. SPAN DATA-TRANSFORMATIONS AND STRATIFICATION CAPABILITY,
by Vladimir V. Almendinger. 4 Mar 65, 42p
Rept. no. TM-1563/014/01
Contract CPR11 1543
See also AD-611 078. Unclassified report

Descriptors: (*Data processing systems, Information retrieval), (*Information retrieval, Correlation techniques), (*Correlation techniques, Information retrieval), Programming (Computers), Transformations (Mathematics), Statistical analysis, Classification, Control sequences, Instruction manuals, Social sciences, Management planning, Urban areas, Compilers.

This document is one of a series of volumes of the SPAN REFERENCE MANUAL describing the SPAN system for data management and statistical analysis. The SPAN system provides an integrated file processing and multivariate analysis capability for problems involving large data matrices with large numbers of variables. The system is oriented to problems of social science in general and urban data analysis in particular. This volume describes the specification and use of SPAN capabilities for the transformation of the contents of a data file in the course of its input to a SPAN process. The data-transformation capability allows the user to state algorithmic procedures leading to the generation of new data variables as transformations of the source data. The entity stratification capability provides for the classification and selection of entity records according to user-specified criteria. (Author)

AD-613 286 Div. 30
CFSTI Prices: HC$3.00 MF$0.75

Westinghouse Electric Corp., Baltimore, Md.
Surface Div.
RESEARCH ON HEURISTIC PROBLEM SOLVING MACHINES.
Final rept. for Mar 64-Mar 65.
Mar 65, 54p Rept. nos. WGD-38093, MDE-4941
Contract Nonr448300, Proj. NR348 008
Unclassified report

Descriptors: (*Decision making, Simulation), (*Learning, Artificial intelligence), (*Computers, Decision making), Reasoning, Cybernetics, Bionics, Decision theory, Game theory, Programming (Computers).

Two approaches to develop learning machines are discussed. One approach is through bionics, in which emphasis is placed upon developing neuron models and neural nets with the aid of knowledge about animal sensory mechanisms. The other approach is through the development of programs with a self-organizing capability.

AD-613 289 Div. 30, 32
CFSTI Prices: HC$3.00 MF$0.75

System Development Corp., Santa Monica, Calif.
SPAN REFERENCE MANUAL DATA FILE MANIPULATION AND PROCESSING.
Technical memo.,
by Vladimir V. Almendinger. 9 Mar 65, 92p
TM-1563/021/01
Contract CPR11 1543
Unclassified report

Descriptors: (*Data processing systems, Specifications), (*Urban areas, Statistical analysis), Management control systems, Data storage systems, Input-output devices, Programming (Computers), Social sciences, Computers.

The document is one of a series of volumes of the SPAN Reference Manual describing the SPAN system for data management and statistical analysis. The SPAN system provides an integrated file processing and multivariate analysis capability for problems involving large data matrices with large numbers of variables. The system is oriented to problems of social science in general and urban data analysis in particular. This volume describes the specification and application of SPAN capabilities for the processing of simple files and for report generation from simple files. Operations utilizing the following SPAN modules are discussed: BCD-to-STARS Conversion, STARS-to-BCD Conversion, STARS Files Abstractor, STARS Files Collator, and STARS Files Summary-Sort. (Author)

AD-613 290 Div. 30
CFSTI Prices: HC$1.00 MF$0.50

System Development Corp., Santa Monica, Calif.
THE INDEPENDENCE OF INHERENT AMBIGUITY FROM COMPLEMENTEDNESS AMONG CONTEXT FREE LANGUAGES,
by T. Hibbard and J. Ullian. 10 Nov 64, 17p
Scientific rept. no. SR-1, TM-738/010/00
Contract AF19 628 3418, Proj. 5632, Task 563205
AFCRL 65-37
Unclassified report

See also AD-284 383, AD-400 371.

Descriptors: (*Programming languages, Theory), Mathematical logic, Set theory, Algebra.

A context free language may be called unambiguous if it is not inherently ambiguous. In the absence of evidence to the contrary, the suspicion has arisen that the unambiguous languages might be precisely those languages with context free complements. The two theorems presented lay the suspicion to rest by providing (I) an inherently ambiguous language with context free complement and (II) an unambiguous language without context free complement. This establishes the independence of inherent ambiguity from complementedness among the context free languages. (Author)

AD-613 291 Div. 30, 32
CFSTI Prices: HC$4.00 MF$0.75

System Development Corp., Santa Monica, Calif.
STYLISTIC ANALYSIS. REPORT ON THE FIRST YEAR OF RESEARCH.
Technical memo,
by Sally Yeates Sedelow. 1 Mar 65, 107p
Rept. no. TM-1908/100/00
Contract Nonr442700 Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Language, Pattern recognition), (*Pattern recognition, Programming (Computers)), Computers, Programming languages, Data storage systems, Indexes, Tables.

The progress and results are described for the first year of research on a computer-based system for analyzing the style and thematic content of natural language text. A comprehensive summary of the program system is provided, as well as an analysis of the results obtained with this system to date. In addition, detailed documentation of the programs and their operation is provided, including flow charts and complete program listings. (Author)

AD-613 324 Div. 30, 4, 25
CFSTI Prices: HC$3.00 MF$0.75

RCA Labs., Div. Radio Corp. of America, Princeton, N. J.
TRACE ANALYSIS OF SOLIDS BY MASS SPECTROMETRY.
Final rept. for 1 Oct 63-30 Nov 64,
by R. E. Honig. Dec 64, 90p
Contract AF19 628 446, Proj. 4608, Task 460802
AFCRL 65-38

Unclassified report

Descriptors: (*Mass spectroscopy, Spectrum analyzers), (*Spectrum analyzers, Performance (Engineering)), (*Impurities, Mass spectrum), Solids, Quantitative analysis, Ion sources, Sparks, Radio-frequency, Trigger circuits, Lasers, Flash lamps, Ion beams.

The report describes studies made on a double-focusing mass spectrograph to improve its performance in the field of trace analyses, particularly the quantitative aspects. Novel approaches to ion-detecting as well as ion-generating schemes are described. (Author)

AD-613 332 Div. 30, 9, 31
CFSTI Prices: HC$3.00 MF$0.75

David Taylor Model Basin, Washington, D. C.
RESEARCH FACILITIES AT THE DAVIS TAYLOR MODEL BASIN.
Oct 64, 62p Rept. no. 1913

Unclassified report

Descriptors: (*Naval research laboratories, Model basins), (*Model basins, Naval research laboratories), Test facilities, Hydrodynamics, Aerodynamic characteristics, Structural properties, Mathematics, Acoustics, Vibration, Maryland.

The David Taylor Model Basin performs applied research, testing, and field trials in hydrodynamics, aerodynamics, structural mechanics, mathematics, acoustics, and vibrations. In support of these efforts the Model Basin and its laboratories have assembled a wide variety of highly specialized facilities, many of which are unique. This report describes these facilities. (Author)

AD-613 483 Div. 30
CFSTI Prices: HC$3.00 MF$0.75

Purdue Research Foundation, Lafayette, Ind.
SYNTHESIS, ANALYSIS AND STABILITY OF NON-LINEAR SYSTEMS.
Annual rept. for Sep 63-Jun 64,
by J. E. Gibson, Z. V. Rekasius, J. R. Rowland, and G. Saridis. Sep 64, 67p Rept. no. TR-EE-64-17
Contract AF29 600 3566, Projs. 6889, PRF3304, Task 688901
MDC TR-65-3

Unclassified report

Descriptors: (*Nonlinear systems, Control systems), (*Control systems, Nonlinear systems), Synthesis, Analysis, Stability, Feedback, Errors, Optimization, Boundary value problems.

An investigation into three specific areas of study pertaining to non-linear control theory and systems is presented. The areas of investigation are: Worst Case Error Analysis, Stability Criteria for Feedback Systems Containing a Single Time-Varying Non-linear Element, and Control with Inequality of Constraints on the State Variables. (Author)

AD-613 521 Div. 30
CFSTI Prices: HC$4.00 MF$0.75

Bureau of Naval Weapons, Philadelphia, Pa.
Engineering Standardization Office.
TECHNICAL ANALYSIS OF BRUSH AND BRUSHLESS TYPE SHAFT POSITION ANALOG-TO-DIGITAL ENCODERS.
15 Feb 65, 112p FSC-5990
Task RREN ST024 200 5 0000 00 000

Unclassified report

Descriptors: (*Analog-to digital converters, Indexes), Magnetic properties, Optical properties, Shafts, Computers, Standardization, Tables.

A tabulation of all existing encoders has been compiled. The devices are of the analog-to-digital type and include the brush and brushless (Magnetic, capacitive and optical) types for which data was available. Indices have been prepared so that it is possible to locate an encoder in the tables when only minimal information is available to the designer. There are four such indices identifiable by size or diameter, output code, manufacturer, and manufacturer's catalog number. In each index five of the parameters considered to be most significant are included to partially define the encoder. The last column directs the reader to the table, via an index number, where all mechanical and electrical characteristics are listed for full identification. (Author)

AD-613 537 Div. 30
CFSTI Prices: HC$3.00 MF$0.75

Office of Aerospace Research, Washington, D. C.
AIR FORCE RESEARCH OBJECTIVES.
1964, 70p

Unclassified report

Limited number of copies containing color other than black and white are available until stock is exhausted. Reproductions will be made in black and white only.

Descriptors: (*Air force research, Research program administration), Solid state physics, Physics, Nuclear physics, Plasma physics, Electronics, Communications theory, Chemistry, Fluid mechanics, Aeronautics, Mechanics, Meteorology, Geophysics, Mathematics, Physiology, Social sciences, Biology.

Contents:
Physical Sciences,
Environmental Sciences,
Mathematical Sciences,
Psychological and Social Sciences,
Biological and Medical Sciences.

AD-613 538 Div. 30, 32
CFSTI Prices: HC$5.00 MF$1.00

Adaptronics, Inc., Alexandria, Va.

THE EPISTEMOLOGICAL FOUNDATIONS OF MACHINE INTELLIGENCE.
Final rept. for 15 Jun 62-15 Jun 63,
by L. O. Gilstrap, Jr. and M. J. Pedelty. 15 Jun 63, 152p
Contract AF33 657 9195, Proj. 4160, Task 416005
ASD TDR-63-877

Unclassified report

Descriptors: (*Artificial intelligence, Theory), Systems engineering, Design, Analysis, Automata, Automation; Automatic, Computers, Computer storage devices, Computer logic, Information retrieval, Gates (Circuits).

Machine intelligence is studied from the standpoint of design. The elements of system design and specific problems of intelligent machine design are presented. Several possible definitions of machine intelligence are discussed. The relationship of physical events to information processing by machines is analyzed and a vector model of intelligent machines is suggested. Overall problems of machine organization are examined and an algebraic theory of machines is tentatively presented as is an alternative model of machines based on the notion of an organized complexity. The possible role of machine intelligence theory in the interpretation of certain types of psychological phenomena is suggested. (Author)

AD-613 592 Div. 30
CFSTI Prices: HC$7.00 MF$2.00

Army Research Office, Durham, N. C.
PROCEEDINGS OF THE ARO WORKING GROUP ON COMPUTERS CONDUCTED AT HARRY DIAMOND LABORATORIES AND THE NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C. 5-7 JANUARY 1964.
Feb 65, 386p Rept. no. ARO-D 65-1

Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Computers, Symposia), (*Symposia, Computers), Numerical analysis, Digital computers, Power series, Algebra, Spheres, Differential geometry, Analog-digital computers, Combinatorial analysis, Decision making, Quality control, Artificial intelligence, Automata, Ranges (Establishments), Real time, Guided missiles, Chemical compounds, Programming languages, Programming (Computers), Weapon systems, Information retrieval, Logistics, Integral equations, Partial differential equations, Analog-digital computers, Simulation, Information retrieval.

AD-613 600 Div. 30, 2, 12
CFSTI Prices: HC$3.00 MF$0.75

National Academy of Sciences, Washington, D. C.
Space Science Board.
BIBLIOGRAPHY ON SPACE SCIENCES (UNITED STATES, 1956-1959).
1959, 88p

Unclassified report

Descriptors: (*Astronautics, Bibliographies), Trajectories, Satellites (Artificial), Tracking, Telemeter systems, Instrumentation, Space environmental conditions, Gravity, Geodesics, Atmosphere, Magnetic fields, Particles, Meteorites, Cosmic rays, Sun, Moon, Planets, Astronomy, Space biology, United States.

Contents:
Orbits, trajectories, and other motions
Tracking and telemetry
Instrumentation and techniques
Interaction between satellite and medium
Gravity and geodesy
Atmospheric composition and structure
Particles and magnetic fields (including interplanetary matter, plasmas, etc.)
Meteorites, cosmic dust, and tektites
The sun (including non-terrestrial phenomena associated with the sun)
The moon and planets
General astronomy
Life sciences.

AD-613 601 Div. 30, 2, 12
CFSTI Prices: HC$3.00 MF$0.75

National Academy of Sciences, Washington, D. C.
Space Science Board.
BIBLIOGRAPHY ON SPACE SCIENCES (UNITED STATES, 1960).
Revised,
1960, 74p

Unclassified report

United States Space Science Program:
Report to COSPAR, Appendix V, Florence, Italy Apr 61.
See also AD-613 600.

Descriptors: (*Astronautics, Bibliographies), Trajectories, Satellites (Artificial), Tracking, Telemeter systems, Instrumentation, Space environmental conditions, Gravity, Geodesics, Atmosphere, Magnetic fields, Particles, Meteorites, Cosmic rays, Sun, Moon, Planets, Astronomy, Space biology, United States.

Contents:
Orbits, trajectories, and other motions
Tracking and telemetry
Instrumentation and techniques
Interaction between space vehicle and medium
Gravity and geodesy
Atmospheric composition and structure
Particles and magnetic fields
Meteorites, cosmic dust, and tektites
The sun
The moon and planets
General astronomy
Life sciences.

AD-613 602 Div. 30, 2, 12, 16
CFSTI Prices: HC$3.00 MF$0.75

National Academy of Sciences, Washington, D. C.
Space Science Board.
BIBLIOGRAPHY ON SPACE SCIENCES (UNITED STATES, 1961).
1961, 80p

Unclassified report

See also AD-613 601.

Descriptors: (*Astronautics, Bibliographies), Trajectories, Satellites (Artificial), Tracking, Telemeter systems, Instrumentation, Space environmental conditions, Gravity, Geodesics, Atmosphere, Magnetic fields, Plasma medium, Particles, Cosmic rays, Meteorites, Sun, Moon, Planets, Astronomy, Space biology, United States.

Contents:
Orbits, trajectories, and other motions
Tracking and telemetry
Instrumentation and techniques
Interaction between satellite and medium
Gravity and geodesy

Atmospheric composition and structure
Particles and magnetic fields (including interplanetary matter, plasmas, aurorae, etc.)
Meteorites, cosmic dust, and tektites
The sun (including non-terrestrial phenomena associated with the sun)
The moon and planets
General astronomy
Life sciences.

AD-613 603 Div. 30, 2, 12, 16
CFSTI Prices: HC$4.00 MF$1.00

National Academy of Sciences, Washington, D. C.
Space Science Board.
BIBLIOGRAPHY ON SPACE SCIENCES (UNITED STATES, 1962).
1962, 135p
Unclassified report

See also AD-613 602.

Descriptors: (*Astronautics, Bibliographies), Trajectories, Satellites (Artificial), Tracking, Telemeter systems, Instrumentation, Space environmental conditions, Gravity, Geodesics, Atmosphere, Particles, Magnetic fields, Meteorites, Cosmic rays, Sun, Moon, Planets, Astronomy, Space biology, United States.

Contents:
Orbits, trajectories, and other motions
Tracking and telemetry
Instrumentation and techniques
Interaction between space vehicle and medium
Gravity and geodesy
Atmospheric composition and structure
Particles and magnetic fields
Meteorites, cosmic dust, and textites
The sun
The moon and planets
General astronomy
Life sciences.

AD-613 604 Div. 30, 2, 12, 16
CFSTI Prices: HC$5.00 MF$1.00

National Academy of Sciences, Washington, D. C.
Space Science Board.
BIBLIOGRAPHY ON SPACE SCIENCES (UNITED STATES, 1963).
Appendix 5,
1963, 153p
Unclassified report

See also AD-613 603.

Descriptors: (*Astronautics, Bibliographies), Trajectories, Satellites (Artificial), Tracking, Telemeter systems, Instrumentation, Space environmental conditions, Gravity, Geodesics, Atmosphere, Magnetic fields, Particles, Meteorites, Cosmic rays, Sun, Moon, Planets, Astronomy, Space biology, United States.

Contents:
Orbits, trajectories, and other motions
Tracking and telemetry
Instrumentation and techniques
Interaction between space vehicle and medium
Gravity and geodesy
Atmospheric composition and structure
Particles and magnetic fields
Meteorites, cosmic dust, and textites
The Sun
The moon and planets
General astronomy
Life sciences.

AD-613 640 Div. 30, 18, 22
CFSTI Prices: HC$5.00 MF$1.25

Naval Ammunition Depot, Crane, Ind.
CURRENT CAPABILITIES FOR CONDUCTING ENVIRONMENTAL TESTS,
by C. M. Austin. 2 Nov 64, 197p QE/C-64-731
Unclassified report

Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Weapon systems, Environmental tests), (*Environmental tests, Weapon systems), (*Navy, Test facilities), Aircraft equipment, Guided missile components, Laboratory equipment, Laboratories, Vibration, Acceleration, Impact shock, Temperature, Humidity, High altitude, Vacuum, Sand, Dust, Fungi, Pressure, Seals (Stoppers).

The environmental test equipment capabilities are presented of the Quality Evaluation Laboratory, located at the U. S. Naval Ammunition Depot, Crane, Indiana. The laboratory has testing equipment and facilities for meeting any requirement for the simulation of climatic and dynamic environmental conditions and for simulating functionally any installation in aircraft, missiles, and shipboard equipment. The total environmental test capability is available for developmental, acceptance, and surveillance evaluation of weapons systems and components, and of explosive pyrotechnics and their component parts. The report is subdivided into the categories of vibration, acceleration, shock, temperature, combined environments, and other environments.

AD-613 694 Div. 30, 17
CFSTI Prices: HC$1.00 MF$0.50

Redstone Scientific Information Center, Redstone Arsenal, Ala.
PHOTOELASTIC DETERMINATION OF ELASTIC AND PLASTIC DEFORMATIONS AND OF CRYSTAL FRAGMENTATIONS IN METALS,
by Z. Zandman. 9 Oct 64, 19p RSIC-306
TT 65-61975
Unclassified report

Trans. of Revue de Métallurgie (France) 1956, v. 53, no. 8, p. 638-644.
Available copy will not permit fully legible reproduction. Reproduction will be made if requested by users of DDC. Copy is available for public sale.

Descriptors: (*Deformation, Test methods), (*Metals, Deformation), (*Test methods, Deformation), France, Refractive index, Surface properties, Photoelasticity, Plastic coating, Crystals, Fracture (Mechanics), Stresses, Loading (Mechanics), Steel, Plasticity.

The paper describes a new method of measuring local deformations created on the surface of metallic or other types of specimens subjected to loads. The method is based on the incidental birefringence acquired by plastic materials subjected to stresses. To measure the surface deformations, the specimen under study is coated with a strongly photoelastic plastic material which follows exactly the deformations of the metal. By measuring the birefringence of the coating, it is possible to calculate the deformation of the metal in the elastic and in the plastic range. Thus, the photoelastic coating fulfills the functions of an infinite number of extensometers, distributed uniformly on all the points of the surface under study. It is possible to pinpoint with high accuracy the start of the plasticizing process, the effect of the geometric shape of the specimen, the crystal fragmentation made according to the metal used, the weak areas of welded,

forged or riveted pieces. The precision of the method is about 0.00005 for the relative elongation.

AD-613 695 Div. 30

Adaptronics, Inc., Alexandria, Va.
RESEARCH OF ADAPTIVE SANDWICHES AND LEARNING AUTOMATA.
Interim engineering rept. no. 3, 2 Aug-15 Nov 64,
by Robert E. J. Moddes and Lewey O. Gilstrap, Jr.
10 Nov 64, 73p
Contract AF33 615 1398

Unclassified report

Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Artificial intelligence, Learning), (*Learning, Servomechanisms), (*Sandwich construction, Thin films (Storage devices)), (*Cybernetics, Reviews), Pattern recognition, Automata, Data processing systems, Analog systems, Light, Photoelectric cells (Semiconductor), Photoelectric materials, Electroluminescence, Laminates, Optics, Modulation, Functions.

A general survey of the status of learning automaton development and application is presented. Of especial interest is the discussion of the assessment of the role of optical modulation as it applies to the realization of learning systems. Data on a 'one-dimensional' device developed under corporate-research are included for comparison with the more complex 'Adaptive Sandwich'. A specific potential application, maze-running, of the 'Adaptive Sandwich' (at its present developmental level) is included. (Author)

AD-613 715 Div. 30, 15
CFSTI Prices: HC$1.00 MF$0.50

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
THE ANALYSIS AND DESIGN OF INTENTIONALLY NONLINEAR FEEDBACK CONTROL SYSTEMS.
Final rept.,
by R. F. Drenick. 27 Aug 64, 13p
Rept. no. PIBMRI-1237-64
Grant DA ARO D31 124G144
AROD 1538:30

Unclassified report

Descriptors: (*Control systems, Optimization), (*Nonlinear systems, Control systems), (*Feedback Nonlinear systems), (*Stochastic processes, Feedback), Statistical analysis, Game theory, Probability, Linear systems, Analysis, Design.

The research was developed along four main lines of study: (1) synthesis of low-sensitivity control systems; (2) optimal control systems; (3) linear equivalents for nonlinear feedback systems; and (4) stochastic theory of feedback control. Efforts resulted in the following conclusions and ideas for future research: the ideas of game theory and statistical decision theory are being brought to bear on the problem of sensitivity (uncertainty); efforts at connecting modern control theory with modern control practice are being followed by recent ideas in which the controlled system is again assumed linear but with randomly varying parameters; the concept of optimality of a control system is being compromised in two directions: (1) solutions must be sought which are insensitive to changes in the assumptions made; and (2) economically realizable systems must be aimed for. (See also AD-408 621; AD-401 799; AD-429 847; and AD-441 554.)

AD-613 717 Div. 30

RAND Corp., Santa Monica, Calif.
SOME SUGGESTED TECHNIQUES FOR DATA SYSTEM DEVELOPMENT.
Revised ed.,
by J. D. Little and W. V. Shelton. Dec 61, 17p
Rept. no. P-2264-1

Unclassified report

For presentation at the Los Angeles Area ACM Technical Symposium held in Santa Monica, Calif., 21 Nov 61
Revision of rept. dated 25 Apr 61
Available only for reference use at DDC field services. Copy is not available for public sale.

Descriptors: (*Data processing systems, Systems engineering), (*Systems engineering, Data processing systems), (*Operations research, Data processing systems), (*Management planning, Data processing systems), Management control systems, Programming (Computers), Scheduling.

This paper proposes a set of techniques: critical-path scheduling, specifically PEP/PERT; data element identification and utilization matrices; and programmed internal reporting functions. These techniques can be used in the planning and management of data system development. The data system may be like ARLS, the Automatic Resupply Logistics System, or a command and control data processing system, or large-scale simulated systems of the type executed at RAND. These techniques could be useful not only in the early planning and implementation phases of system development but also in later stages when analysis of current and earlier models of the system is taking place. Critical-path scheduling is especially applicable during early stages of development and as a control device throughout development activities. Data identification and utilization matrices are particularly suited to the working level management of data system development. The use of internal reporting functions during later development stages provides valuable and necessary information for further development activities. (Author)

AD-613 721 Div. 30, 25
CFSTI Prices: HC$2.00 MF$0.50

Laboratory for Electronics, Inc., Boston, Mass.
ELECTRO-OPTICAL MATRIX DISPLAY.
Quarterly interim development rept. no. 3, 1 Nov 64-31 Jan 65.
Mar 65, 26p Rept. no. 480-Q3
Contract NObsr91199

Unclassified report

See also AD-610 510.

Descriptors: (*Thin films (Storage devices), Display systems), (*Magneto-optic effect, Thin films (Storage devices)), (*Computer storage devices, Thin films (Storage devices)), Ferromagnetic materials, Powder metals, Nickel, Iron, Colloids, Films, Epoxy plastics.

Phase I of the program was completed. Some further work on film preparation parameters resulted in good display properties combined with lower coercive force. These results were obtained using melt compositions of 83/17 Ni-Fe, high evaporation rates, and high substrate temperature. A substantial development effort in preparation of display colloid has resulted in a good understanding of the nature of the several processes that can be used. Good control in the colloid preparation is possible with a process based on forming first a seed solution of particles of small and very uniform size, then controlledly enlarging the seed particles, and finally adding the magnetic property. Techniques of panel module assembly were studied including edge encapsulation, inner bonding and silk screening. Experimental cells were made that show no sign of seal deficiency after five months. (Author)

AD-613 808 Div. 30, 2, 25

Aerospace Research Labs., Office of Aerospace Research, Wright-Patterson AFB, Ohio.
AN IMAGE-CONVERTER OBJECTIVE-GRATING SPECTROGRAPH FOR THE AIRBORNE OBSERVATION OF THE INFRARED FLASH SPECTRUM,
by Kenneth E. Kissell. 1963, 12p ARL 65-28
Unclassified report

Pub. in Instrument Society of America. Transactions (U. S.) v3 n3 p220-8 Jul 1964 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Infrared spectrophotometers, Dolar atmosphere), (*Solar atmosphere, Infrared spectrophotometers), (*Infrared image tubes, Solar atmosphere), Spectra (Infrared), Airborne, Design.

An attempt was made to extend the chromospheric spectrum into the far photographic infrared utilizing one of the high-resolution image converter tubes available. A simple, manually-operated image-tube spectrograph was constructed. Judicious choice of the operational equipment and the skill of the light operations led to successful recording of spectral lines from 9000 to 11,000 Angstroms, approximately doubling the number of known chromospheric spectral emissions in this region. The design, development, and experience in operation of the apparatus are presented, along with examples of spectra taken with the instrument.

AD-613 835 Div. 30

Washington Univ., Seattle.
SIEVE CALIBRATION,
by Dean A. McManus. 17 Jul 62, 2p
Technical rept. no. TR-103
Contract Nonr477 10, Proj. NR083 012
Unclassified report

Pub. in Journal of Sedimentary Petrology (U. S.) v33 n4 Dec 1963 (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Material separation, Calibration), (*Porous materials, Material separation), Sedimentation, Soils, Particle size, Glass, Spheres, Petrology.

The average aperture size of a sieve may vary 0.08 phi-unit from the stated aperture size because of manufacturing tolerances. For sediment studies requiring greater than routine precision this possible error can be eliminated by calibrating the sieves with samples of glass spheres especially prepared for sieve calibration by the National Bureau of Standards. The routine particle size analysis of sediments, however, does not require the use of calibrated sieves. (Author)

AD-613 907 Div. 30, 22

Suffield Experimental Station, Ralston (Alberta).
A TRACER TECHNIQUE FOR CRATERING STUDIES. Revised ed.,
by C. H. H. Diehl and G. H. S. Jones. 2 Sep 64, 5p
Unclassified report

Pub. in Journal of Geophysical Research (U. S.) v70 n2 p305-9 Jan 15 1964 (Copies not available to DDC or Clearinghouse customers). Revison of manuscript submitted 9 Jun 64.

Descriptors: (*Cratering, Identification systems), TNT, Soil mechanics, Position finding, Detection, Colors, Sand, Motion, Geophysics, Containers, Experimental data.

A method is outlined whereby marker cans are used in colored sand columns to measure the ejecta and ground movements in the vicinity of a crater from a 20-ton surface burst TNT detonation. It is shown that the use of marker cans greatly increases the data obtained from the sand columns, with comparatively little increase in the cost of the operation. Also, data are obtained in the form of displacement vectors which may be compared with the velocity vector field predicted by hydrodynamic theory. (Author)

31. Ships and Marine Equipment

AD-613 202 Div. 31, 2
CFSTI Prices: HC$1.00 MF$0.50

Directorate of Physical Research, Defence Research Board, Ottawa (Ontario).
ICE-CUTTING SHIPS AND HIGH-PRESSURE WATER JETS FOR CUTTING ICE,
by I. S. Peschanskii. Oct 64, 7p
Rept. no. Misc. G-18
TT 65-61861
Unclassified report

Trans. from mono. Ledovedenie i Ledotekhnika (Ice Physics and Engineering) Leningrad, 1963.

Descriptors: (*Ice breakers, Design), (*Ice, Cutting fluids), Cantilever beams, Water, Jets, Canada, USSR.

The ice-cutting ship is a vessel equipped with a complex mechanism for cutting, breaking, and transporting the ice. It is designed to provide an open ice-free channel in fast ice for the passage and towing of ships. The special feature of the ice-cutting ship is that by its forward movement it cuts a strip of ice supported at one end (a cantilever beam) rather wider than the ship itself. The cutting may be achieved by means of mechanical cutters, high-pressure hydraulic jets, or other applied physical principle. Owing to the forward motion of the ship and the configuration of the bow, which slopes at an angle of 15 degrees to the sea surface, the ice strip is bent, reaches the critical point and breaks into pieces by its own weight. The ice-cutter has a number of advantages over the icebreaker. These advantages are as follows: (a) The ice-cutter forms a straight, even channel, wider than that cut by an icebreaker; (b) The ice-cutter expends less energy on the whole operation - cutting, breaking, and removing the ice - than does the icebreaker. (c) The channel left by the ice-cutter remains clear and suitable for the passage of even the most thin-skinned ships. Thus the ice-cutter would make it possible: (a) to cut channels in sea and river bays for the passage of ships into ports in winter; (b) to cut fast ice and so allow earlier navigation in arctic seas; (c) to cut channels in the autumn and so extend the navigation season after the ice forms; (d) to cut channels in reservoirs in winter.

AD-613 262 Div. 31

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
EXPERIMENTAL STUDY OF PROPELLER-INDUCED VIBRATORY PRESSURES ON SIMPLE SURFACES AND CORRELATION WITH THEORETICAL PREDICTIONS.
Final rept.,
by J. P. Breslin and T. Kowalski. Mar 65, 19p
Rept. no. 973
Contract Nonr26350, Projs. S R009 01 01, 2651 054
Unclassified report

Pub. in Journal of Ship Research (U. S.) v8 n3 p15-28 Dec 1964(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Ship hulls, Hydrodynamics), (*Propellers (Marine), Vibration), Ship plates, Models (Simulations), Pressure, Force (Mechanics), Surfaces, Experimental data, Correlation techniques, Theory, Pressure gages.

Vibratory pressures exerted on cylindrical and flat-plate boundaries due to a model propeller were measured at three advance coefficients. A number of 'free-space' measurements also were made. All measurements were made by driving a propeller past fixed pressure gages. This method yielded curves of pressure changes which are entirely free from background noise. The magnitudes of the free-space pressures were found to be larger than one half the corresponding magnitudes measured by gages mounted flush in a large plate at equal clearances from the propeller. By postulating that the finite area of the gage diaphragm produces a partial image of the propeller (and hence a larger pressure than that in free space) an experimental procedure was devised for correcting for this finite-area effect yielding results in good agreement with theory. A theoretical treatment of this effect of finite gage size is given. The decay of maximum amplitudes of vibrating pressures is shown by means of three-dimensional plots. The pressures were found to become vanishingly small within approximately one propeller diameter fore and aft of the center of the propeller. The comparison with theoretically calculated pressures and forces gives very close agreement for free-space pressures and reasonable agreement for forces on a cylindrical surface. The agreement of both pressures and forces with theory is excellent for operation near the design advance ratio. (Author)

AD-613 270 Div. 31
CFSTI Prices: HC$1.00 MF$0.50

Ship Structure Committee, NAS-NRC, Washington, D. C.
INDEX OF SHIP STRUCTURE COMMITTEE PUBLICATIONS.
Apr 65, 15p
Unclassified report

Descriptors: (*Ship structural components, Bibliographies), (*Bibliographies, Ship structural components), Ship plates, Steel, Welding, Indexes, Mechanical properties.

A bibliography of 181 references is given.

AD-613 330 Div. 31
CFSTI Prices: HC$3.00 MF$0.75

Atlantic Research Corp., Alexandria, Va.
FEASIBILITY STUDY OF FLOTATION OF SUNKEN VESSELS BY INJECTION OF FOAMED FLOTATION MATERIAL.
Final rept.,
by C. B. Darley. Mar 65, 85p
Rept. no. TR-PL-6953-00-0
Contract NObs90437, Proj. SR007 03 04, Task 1013
Unclassified report

Descriptors: (*Ships, Salvage), (*Salvage, Ships), (*Buoyancy, Materials), Flotation, Expanded plastics, Feasibility studies, Pressure, Diving, Underwater equipment, Submarines, Costs, Model tests.

Continued laboratory experimentation under pressurized water and a test demonstration at the Experimental Diving Unit have resulted in the conclusion that technically and economically it is feasible to inject foamed flotation materials into sunken vessels to refloat them. A foamed salvage method is estimated to take less than one-tenth the time and cost less than one-half of a conventional salvage operation. Continued experimentation is necessary to fully develop the method and materials of foamed flotation. (Author)

AD-613 370 Div. 31

Navy Experimental Diving Unit, U. S. Naval Station, Washington, D. C.

ADAPTATION OF HELIUM-OXYGEN TO MIXED-GAS SCUBA,
Interim rept.,
by Robert D. Workman and Joseph L. Reynolds.
1 Mar 65, 70p Research rept. no. RR-1-65
Proj. F011 06 01, Task 3361
Unclassified report

Available only for reference use at DDC field services. Copy is available for public sale.

Descriptors: (*Breathing apparatus, Diving), (*Diving, Breathing apparatus), (*Scuba divers, Breathing apparatus), Helium, Oxygen, Mixtures, Decompression sickness, Underwater equipment, Human engineering, Swimming.

A decompression procedure for use of helium-oxygen mixtures in mixed gas SCUBA to permit repetitive dives to a depth of 200 feet has been developed employing modified Haldane principles. The repetitive diving procedure provides a system by which a diver can determine the necessary increase in decompression time on successive dives, based on the amount of excess inert gas tension in body tissues after completion of previous dives. The amount of decompression required is decreased by the time interval at the surface between dives. The information required for use of this system is obtained from four tables: (1) Decompression table (2) No decompression dive table (3) Surface interval credit table and (4) Repetitive dive time table. A method for use of oxygen decompression at 30 and 20 foot water stops is also provided. The validity of this procedure is based on tests of 486 dives in which 28 three-dive series and 68 oxygen decompression dives were made. The procedure as reported is considered satisfactory and is recommended for further testing under operational conditions in the field before service-wide use. (Author)

AD-613 552 Div. 31
CFSTI Prices: HC$1.00 MF$0.50

Naval Research Lab., Washington, D. C.
TENSILE STRESSES ON THE SURFACE OF AN ELLIPSOIDAL CAVITY IN COMPRESSIVE LOADING SITUATIONS,
Interim rept.,
by D. R. Mulville and J. A. Kies. 12 Mar 65, 13p
Rept. no. NRL-6210
Proj. WW041
Unclassified report

Descriptors: (*Pressure vessels, Compressive properties), Brittleness, Solids, Bubbles, Ellipsoids, Tensile properties, Stresses, Hydrostatic pressure, Failure (Mechanics), Submarine hulls.

The stresses on the walls of embedded cavities have been investigated, particularly for compressive loading situations corresponding to those for shells for deep submergence. The discrepancy between theoretical and measured compressive strength of brittle solids is one motivating factor for extending this investigation. The maximum tensile stress components are equal numerically to the applied compressive stress. The maximum tensile stresses depend on the shape of the cavity, Poisson's ratio, and the orientation of the cavity in the shell. It is recommended that the work continue with the aim of showing the effects of cavities on strength. One approach recommended is to calculate the effects of cracks in the walls of the cavities. (Author)

AD-613 626 Div. 31
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
SHIP WEIGHT DATA CONVERSION FROM MARITIME TO NAVAL CLASSIFICATION,
by Henry P. Rumble. Mar 65, 24p Rept. no. P-3093
Unclassified report

Descriptors: (*Weight, Ships), (*Ship structural components, Weight), Classification, Marine engineering, Data, Naval vessels (Combatant).

There are disparities between the design and building practices of U. S. maritime and of naval ship construction. Examination of these disparities is made difficult by differences between the associated systems for estimating and tabulating weight data. This paper presents a means for converting weight information from the Maritime system to the Navy weight system. This conversion system was devised to assemble and present, on a common basis, data from these different weight estimating systems.

AD-613 812 Div. 31, 2

Scripps Institution of Oceanography, Univ. of California, La Jolla.
AN EVALUATION OF RECENT RESEARCH VESSEL CONSTRUCTION IN THE UNITED STATES,
by John Dermody, Jonathan Leiby, and Maxwell Silverman. 1964, 18p
Contract Nonr221623, Proj. NR083 005
Unclassified report

Pub. in mono. (advance copy of paper) to be presented at the Annual Meeting of the Society of Naval Architects and Marine Engineers, New York, 12-13 Nov 64. (Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Oceanographic vessels, Construction), Naval research, Costs, Marine engineering, Design, Ship structural components, Operation.

Since the late nineteen fifties the American oceanographic fleet has increased from a small number of converted tugs, fishing boats, and yachts in an orderly progression to a sizable group of specially designed research vessels. The United States is at the midpoint of a ten-year program which hopefully will create the research vessels capable of performing the quality of productive scientific work required by our national interests. An examination is made in this paper of the technical, economic and contractual factors controlling the basic approaches to research vessel funding. The influence of the oceanographic community on ship design is traced and the development of the class concept of research vessels is discussed. Emphasis is placed on the degree of supervision employed by the oceanographic user throughout the various phases of design and construction. (Author)

32. Miscellaneous Arts and Sciences

AD-613 259 Div. 32, 30
CFSTI Prices: HC$2.00 MF$0.50

System Development Corp., Santa Monica, Calif.
APPLICATIONS OF COMPUTERS AND INFORMATION PROCESSING SYSTEMS IN EDUCATION.
Professional paper,
by John F. O'Toole, Jr. 12 Mar 65, 34p
Rept. no. SP-1980

Unclassified report

Descriptors: (*Data processing systems, Education), (*Computers, Education), (*Education, Data processing systems), Information retrieval, Teaching machines, Theory, Reviews.

The purpose of this report is to provide information for the uninitiated educator and interested layman; in essence, to place electronic data processing (EDP) in education in both factual and speculative perspective. The report is intended for the EDP specialist only to the extent that some understanding of current educational problems will help him to assist educators with the data processing aspects of these problems. The complete report to the U. S. Office of Education ('Application of Electronic Data Processing Methods in Education'), of which this paper is only a chapter, represents a study of uses, problems, issues and promising directions of research and development in electronic data processing in education. The scope of present computer and EDP school applications is outlined, including explanations of technical terms, facilities, and equipment currently in school use. Succeeding pages provide brief descriptions of illustrative applications arranged in the following substantive categories: (1) educational information systems, (2) research applications, and (3) computer education programs. The intent here is to provide a sampling of resources currently available in educational settings and their utilization at the time of this report. (Author)

AD-613 301 Div. 32
CFSTI Prices: HC$3.00 MF$0.75

Dayton Univ., Ohio. Research Inst.
THE MODIFICATION OF AN INFORMATION RETRIEVAL SYSTEM BY IMPROVING VOCABULARY CONTROL, INDEXING CONSISTENCY AND SEARCH CAPABILITIES.
Final summary rept. for 1 Dec 63-30 Nov 64,
by Edward A. Janning. Mar 65, 88p
Contract AF33 615 1132, Proj. 7381, Task 738103
ML TR-65-20

Unclassified report

See also AD-428 423.

Descriptors: (*Information retrieval, Vocabulary), (*Subject indexing, Vocabulary), Reports, Organic compounds, Inorganic compounds, Metallurgy, Alloys, Polymers, Ceramic materials, Composite materials, Eutectics, Physics.

This report describes the need for and establishment of vocabulary controls for a coordinate indexing retrieval system involving multidisciplinary terminology. Included in the controls is an improved fragmentation system for the handling of organic compounds. The elimination of role indicators from the indexing procedures is also briefly discussed. The system that is described was established to handle the scientific and technical documents that are on file in the library facility of the Air Force Materials Laboratory. Approximately 16,000 documents have been indexed and the revised thesaurus contains slightly over 10,000 terms. (Author)

AD-613 311 Div. 32, 30
CFSTI Prices: HC$3.00 MF$0.75

RAND Corp., Santa Monica, Calif.
COMPUTATIONAL LINGUISTICS: BIBLIOGRAPHY, 1964,
by David G. Hays and Roxana Ma. Mar 65, 60p
RM-4523-PR
Contract AF49 638 700

Unclassified report

Descriptors: (*Language, Bibliographies), (*Documentation, Bibliographies), (*Computers, Bibliographies), Classification, Programming languages, Computers, Computer storage devices, Machine translation, Dictionaries, Subject indexing, Information retrieval, Search theory, Coding, Decoding, Input-output devices, Abstracting.

Contents (809 items):
Classification theory
Computation and programming
Computational linguistics
Computers and hardware
Documentation
Linguistics
Non-numerical computer applications
Psycholinguistics
Author index
Organization index

AD-613 315 Div. 32

Columbia Univ., New York.
STUDY INSTRUMENTS: SECOND WAVE BRAZIL AND FINLAND,
by Jiri Nehnevajsa and Albert Frances. 15 Oct 60, 70p
Contract AF49 638 743
AFOSR TN-60-1360

Unclassified report

Rept. on Research on Comparative Impact of Actual Versus Anticipated Events, Proj. OUTCOMES. Available only for reference use at DC field services. Copy is not available for public sale.

Descriptors: (*Political science, Public opinion), (*Public opinion, Political science), Foreign policy, Attitudes, Sampling, Statistical analysis, Sociology, Test methods, Probability, Communism, Brazil, Finland.

A system of questions was developed which would tap information as well as saliency without enlarging the scope of the basic study instrument. In the second wave of questioning, the subjects--both panel and new sample--were asked open-ended questions about events which may have increased significantly the likelihood of: voluntary drift of non-Communist nations toward Communism (by 1965); pro-Communist revolutions; war between non-Communist nations; World War III; war between Communist nations (especially USSR against China); drift toward democracy in major Communist nations; reconciliation; Third Force emergence; dissolution of Western Alliances; dissolution of Soviet Alliances; disarmament; small wars between Communist and non-Communist powers (which do not mushroom into World War III); continuation of status quo; and anti-Communist revolutions. Respondents were asked to specify events, if any, which in his opinion may have the effect he is asked about. It is assumed that when such specific events are listed, the

respondent is (a) informed about them, and (b) considers them salient. The present instrument tells about events which force themselves into his mind immediately (when asked), and which are, therefore, of paramount saliency with regard to the item under scrutiny. (Author)

AD-613 326 Div. 32
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
RECONNAISSANCE FOR THE WAR ON POVERTY,
by Anthony H. Pascal. Mar 65, 8p
Rept. no. P-3092
Unclassified report

Descriptors: (*Economics, United States), (*Social sciences, United States), Money, Wages, Labor, Population, Education, Urban areas.

AD-613 328 Div. 32
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
MUTUAL FUND PERFORMANCE: MEASUREMENT AND PREDICTION,
by W. F. Sharpe. Mar 65, 37p Rept. no. P-3096
Unclassified report

Descriptors: (*Economics, Probability), Money, Banking, Statistical functions.

AD-613 337 Div. 32
CFSTI Prices: HC$4.00 MF$1.00

Air Force Cambridge Research Labs., Bedford, Mass.
MONOGRAPH CATALOGING MANUAL.
Jun 64, 117p
Unclassified report

See also AD-435 615.

Descriptors: (*Libraries, Automation), (*Automation, Libraries), (*Documentation, Instruction manuals), (*Catalogs, Instruction manuals), Reports, Subject indexing, Information retrieval, Classification, Typewriters, Programming (Computers).

Temporary instructions, issued as each phase of the overall plan is accomplished and tested, will eventually be published for Serials Control and Cataloging, Acquisitions (Order and Receipt) Binding, and Special Routines (including Computer Programs). The Monograph Cataloging Manual serves to: (1) Set forth for the monograph cataloger the authorities and practices adopted by the Library in cataloging its technical publications. (2) Set forth for the machine room operators the machine configurations, encoding formats, and output requirements of the automated system. (3) Interrelate the functions of both cataloger and data processor in description of work flow from point of cataloging through subsequent processing operations (generation and filing computer tapes, book preparation, and preparation of accessory records) to the point of circulation and reference activities.

AD-613 369 Div. 32, 15
CFSTI Prices: HC$1.00 MF$0.50

Carnegie Inst. of Tech., Pittsburgh, Pa. Graduate School of Industrial Administration.
THEORY AND APPLICATION OF AN INFERENCE MODEL FOR NON-STATIONARY TIME SERIES MEANS. Final rept.,
by Melvin Hinich and John U. Farley. Dec 64, 22p
Management sciences research rept. no. MSRR-27
Contract Nonr76024, Proj. NR047 048
Unclassified report

Descriptors: (*Mathematical models, Commerce), (*Commerce, Mathematical models), (*Decision making, Commerce), Sampling, Stochastic processes, Statistical distributions, Communication theory, Matrix algebra, Economics, Consumption, Distribution (Economics).

Complex time series models, such as consumer brand shifting analyses, have required assumptions of parameter stability because statistical models to deal with parameter change were not available. A model is developed here to make inferences about a possibly nonstationary time series mean generating data with Gaussian error. Estimators which are efficient in a special sense are presented, along with examples and suggested applications of the method to brand switching problems. (Author)

AD-613 374 Div. 32
CFSTI Prices: HC$1.00 MF$0.50

Air Force Office of Scientific Research, Washington, D. C.
DOCUMENTATION ACTIVITIES IN THE UNITED STATES OF AMERICA,
by Rowena Swanson. Dec 63, 25p AFOSR-5445
Unclassified report

Descriptors: (*Documentation, United States), United States Government, Periodicals, Department of Defense, Scientific research, Reports, Libraries, Indexes, Information retrieval, Professional personnel, Training.

AD-613 376 Div. 32, 30

System Development Corp., Santa Monica, Calif.
SOME PARAMETERS FOR COMPUTATIONAL STYLISTICS: COMPUTER AIDS TO THE USE OF TRADITIONAL CATEGORIES IN STYLISTIC ANALYSIS,
by Sally Yeates Sedelow, Walter A. Sedelow, Jr., and Terry Ruggles. 1964, 21p
Contract Nonr442700
Unclassified report

Pub. in mono. IBM Literary Data Processing Conference, Yorktown, N. Y., 1964. Proceedings p211-29
(Copies not available to DDC or Clearinghouse customers).

Descriptors: (*Machine translation, Pattern recognition), (*Pattern recognition, Language), (*Language, Pattern recognition), Data processing systems, Computers, Programming languages, Compilers, Programming (Computers).

'Computational Stylistics,' the use of computers for a rigorous description and analysis of pattern attributes of text, is result of a desire to give contemporary technology focused upon language processing the benefit of analytical methods devised and used by literary critics and, at the same time, to give literary critics the benefit of tools provided by contemporary technology-- i.e., the large digital computer and new programming procedures.

AD-613 469 Div. 32
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
AN ANNOTATED BIBLIOGRAPHY OF PUBLICATIONS ON DEPENDENCY THEORY,
by David G. Hays. Mar 65, 22p
Rept. no. RM-4479-PR

Contract AF49 638 700

Unclassified report

Descriptors: (*Machine translation, Bibliographies), (*Documentation, Machine translation), Language, Analysis, Programming (Computers), Automation, Synthesis, Information retrieval, Data processing systems.

The books and papers listed in the bibliography have in common a concern with the notion that syntax is best described by specifying word-to-word connections, generally called 'dependencies,' rather than by segmentations of sentences. Some of the works listed contribute to the development of a formal dependency theory in linguistics. Others apply the growing theory to the description of natural languages and to the design of computer systems for machine translation, information retrieval, and other purposes. A few of the papers cited criticize and reject the dependency notion.

AD-613 516 Div. 32
CFSTI Prices: HC$6.00 MF$1.50

Center for International Studies, Mass. Inst. of Tech., Cambridge.
SOVIET INTERESTS IN ARMS CONTROL AND DISARMAMENT. THE DECADE UNDER KHRUSHCHEV 1954-1964,
by Lincoln P. Bloomfield, Walter C. Clemens, and Franklyn Griffiths. 1 Feb 65, 254p Rept. no. C/65-1
Contract ACDA IR15

Unclassified report

See also AD-613 517, AD-613 518, AD-613 570.

Descriptors: (*Arms control, USSR), (*Disarmament, USSR), (*USSR, History), Economics, Political science, Cuba, China, Nuclear warfare, United States Government, Strategic warfare, Deterrence.

Contents:
The spirit of Geneva: A new round after Stalin, 1954-1956
Manifest Soviet policies
Factors conditioning Soviet policies
The rise and decline of the 'Spirit of Geneva'
From Sputnik to Cuba: 1957-1962
Manifest Soviet policies
Factors conditioning Soviet policies
The period in retrospect
The spirit of Moscow: Detente and limited arms control agreements: 1962-1964
Manifest Soviet policies
Factors conditioning Soviet policies
The Soviet interest in agreements and detente
Conclusions: The decade in retrospect; Soviet interest in arms control; 1965-A postscript.

AD-613 517 Div. 32
CFSTI Prices: HC$2.00 MF$0.50

Center for International Studies, Mass. Inst. of Tech., Cambridge.
SOVIET INTERESTS IN ARMS CONTROL AND DISARMAMENT. THE DECADE UNDER KHRUSHCHEV 1954-1964.
Summary rept.,
by Lincoln P. Bloomfield, Walter C. Clemens, and Franklyn Griffiths. 1 Feb 65, 27p Rept. no. C/65-1A
Contract ACDA IR15

Unclassified report

Descriptors: (*Arms control, USSR), (*Disarmament, USSR), (*USSR, History), Economics, Political science, Cuba, China, Nuclear warfare, United States Government, Strategic warfare, Deterrence.

The study whose findings are summarized (AD-613 516) has as its object to analyze the chief factors, both internal and external, that go into the formulation of Soviet arms control and disarmament policy for recent periods of both high and low apparent Soviet interest in arms control. The governing purpose has been to see if it is possible to discern in more general terms the configurations of factors related to Soviet interest in certain forms of limitations on the arms race. Continuity and change were examined in the strategic-military situation, the external political conditions, and in the economic and the internal political situations in the decade under Khrushchev, beginning in 1954-1956 with the first signs of what proved to be a significant shift in Soviet policy; following the evolution of the patterns and factors that had emerged from 1957 through late 1962; and ending by focusing on the manner in which these elements came together in 1963-64 to produce some East-West arrangements on arms control. The manifest expressions of arms control policy in the form of negotiations and propaganda are outlined, and the surface policy is searched to analyze the key relevant contextual factors.

AD-613 518 Div. 32
CFSTI Prices: HC$4.00 MF$1.00

Center for International Studies, Mass. Inst. of Tech., Cambridge.
THE SOVIET POSITION ON ARMS CONTROL AND DISARMAMENT. NEGOTIATIONS AND PROPAGANDA, 1954-1964. AN ANNEX TO REPORT ON SOVIET INTERESTS IN ARMS CONTROL AND DISARMEMENT,
by Walter C. Clemens and Franklyn Griffiths. 1 Feb 65, 121p Rept. no. C/65-2
Contract ACDA IR15

Unclassified report

See also AD-613 516.

Descriptors: (*Arms control, USSR), (*Disarmament, USSR), (*USSR, History), (*Propaganda, USSR), United States Government, Cuba, Armament, Political science.

Contents:
The spirit of Geneva: A new round after Stalin, 1954-1956
The negotiations: Style and substance
Political and propaganda uses of the disarmament issue
From Sputnik to Cuba, 1957-1962
The negotiations: Style and substance
Communications: The propaganda and ideology of disarmament
The spirit of Moscow: Detente and limited arms control agreements, 1962-1964
The negotiations: Style and substance
The propaganda and ideology of disarmament

AD-613 525 Div. 32
CFSTI Prices: HC$2.00 MF$0.50

Syracuse Univ., N. Y. Research Corp.
SCIENCE AND TECHNOLOGY IN THE 1985 ERA.
Suppl. rept.
15 Mar 64, 47p
Contract Nonr434500

Unclassified report

Supplemental to rept. THE UNITED STATES AND THE WORLD IN THE 1985 ERA, AD-613 527.

Descriptors: (*United States, Theory), Probability, Economics, Transportation, Communication systems, Computers, Electric power production, Astronautics, Minerals, Fuels, Water supplies, Agriculture, Food,

Marine biology, Public health, Medicine, Diseases, Sociology, Education, Scientific research.

Contents: Selected technologies in 1985 (Transportation, communications, computers and automation, electric power, space technology); Natural resources (minerals and fuels, water, world agriculture and food supply, marine resources, processed and synthetic materials); Public health and medicine (incidence of disease and expected cures, social conditions influencing health, organization of medical practice and education).

AD-613 526 Div. 32, 30
CFSTI Prices: HC$7.05 MF$2.00

Syracuse Univ., N. Y. Research Corp.
SCIENCE AND TECHNOLOGY IN THE 1985 ERA; APPENDIX COMMITTEE REPORTS).
May 64, 405p
Contract Nonr434500

Unclassified report

See also AD-613 525.

Descriptors: (*Scientific research, United States), (*United States, Theory), Probability, Economics, Air pollution, Marine biology, Geology, Water supplies, Energy, Minerals, Medicine, Public health, Parasites, Biology, Weather forecasting, Artificial precipitation, Chemistry, Physics, Mathematics, Materials, Psychology, Desalination, Electric power production, Computers, Data processing systems, Industrial production, Communication systems, Astronautics, Transportation.

Contents:
Natural sciences
Physical sciences
Social sciences
Technology.

AD-613 527 Div. 32
CFSTI Prices: HC$4.00 MF$1.00

Syracuse Univ., N. Y. Research Corp.
THE UNITED STATES AND THE WORLD IN THE 1985 ERA.
15 Mar 64, 135p
Contract Nonr434500

Unclassified report

Descriptors: (*United States, Theory), Political science, Economics, Military organizations, Labor, Management engineering, Industrial production, Scientific research, Foreign policy, Probability, Standards.

The purpose of the study is to examine projected national objectives and policies, and international and domestic military, economic, and technological factors affecting the United States in the 1985 era.

AD-613 528 Div. 32
CFSTI Prices: HC$5.00 MF$1.00

Syracuse Univ., N. Y. Research Corp.
THE UNITED STATES AND THE WORLD IN THE 1985 ERA; APPENDIXES ONE AND TWO,
May 64, 155p
Contract Nonr434500

Unclassified report

See also AD-613 527.

Descriptors: (*United States, Theory), Political science, Economics, Industrial production, Probability, Standards, Tables, Graphics, Indexes, Bibliographies, Construction, Textiles, Transportation, Fuels, Containers, Recreation, Metals, Minerals, Food, Labor, Population, Wages, Foreign aid, Education, Commerce, Agriculture, Water supplies.

Appendix One is a collection of charts, graphs, tables and indexes. A bibliography of the sources utilized in the preparation of such projections is included as Appendix Two.

AD-613 570 Div. 32
CFSTI Prices: HC$3.00 MF$0.50

Center for International Studies, Mass. Inst. of Tech., Cambridge.
ECONOMIC FACTORS AND SOVIET ARMS CONTROL POLICY. THE ECONOMIC BURDEN OF THE SOVIET DEFENSE EFFORT,
by Fritz Ermarth. 2 Nov 64, 51p
Rept. no. D/64-34
Contract ACDA IR15

Unclassified report

Annex to Soviet Interests in Arms Control and Disarmament, AD-613 516.

Descriptors: (*Economics, USSR), (*Arms control, USSR), (*USSR, History), Armed forces budgets, Budgets, Labor, Military personnel, Industries, Agriculture, Armament, Political science.

Contents:
Soviet defense expenditures, 1950-1965
- Difficulties and complications
- The official defense budget
- The 'real' defense budget
- The cost of military manpower
- Trends in Soviet defense spending

The economic impact of the Soviet defense effort
- Defense as a component of GNP
- Industrial growth trends
- Industrial labor resources
- Defense and industrial technology
- Alternative demands for resources: agriculture and consumption
- Trends in the growth of Soviet GNP

Conclusions
- The framework of choice
- Policy in the Krushchev era.

AD-613 628 Div. 32
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
THE ECONOMICS OF HOUSING SEGREGATION,
by Anthony H. Pascal. Mar 65, 30p
Rept. no. P-3095

Unclassified report

Descriptors: (*Economics, Housing), (*Housing, Urban areas), Population, Labor, Wages, Sociology, Statistical data, Tables.

This monograph attempts to separate the observed segregation of nonwhites in U. S. cities into that which is attributable to socio-economic differences between races and that which is attributable to prejudice. The results should have practical relevance where there is a desire to reduce segregation, and a choice must be made on the efficacy of, e.g., 'fair housing' laws versus policies designed to raise the relative income levels of nonwhites. The major hypothesis tested is that all

observed residential segregation is socio-economic in character, i.e., is attributable to white/nonwhite differentials in income and wealth, family size and composition, and the job location of its working members. This hypothesis proved untenable and this conclusion was supported by supplementary tests. Neither could much of a case be made for voluntary segregation by nonwhites as an explanation of their residential pattern. (Author)

AD-613 649 Div. 32, 18
CFSTI Prices: HC$2.00 MF$0.50

RAND Corp., Santa Monica, Calif.
PROBLEMS OF SOVIET DEFENSE POLICY UNDER THE NEW REGIME,
by Thomas W. Wolfe. Mar 65, 28p
Rept. no. P-3098
Unclassified report

Descriptors: (*Defense systems, USSR), (*Political science, USSR), Leadership, Economics, Government (Foreign), Armed forces (Foreign), Strategic warfare, Weapon systems, Decision making, Communism.

The problems which confront the new leaders of the USSR with respect to the economy, Sino-Soviet relations, intra-bloc unity, and the crisis in Southeast Asia are discussed. The report has a particular focus on defense policy matters, but recognizes the fact that military considerations are intimately bound up with many other aspects of Soviet policy -- the problem of resource allocation, the problem of reconciling East-West detente with Soviet obligations to international communism and the national-liberation movement.

AD-613 656 Div. 32, 18
CFSTI Prices: HC$1.00 MF$0.50

RAND Corp., Santa Monica, Calif.
A REVIEW OF WILLIAM W. KAUFMANN'S, THE McNAMARA STRATEGY,
by Bernard Brodie. Mar 65, 23p P-3077
Unclassified report

Descriptors: (*Political science, Department of Defense), (*Department of Defense, Military strategy), Leadership, Supervisory personnel, Decision making, United States Government, Deterrence, Reviews.

AD-613 669 Div. 32, 15, 26
CFSTI Prices: HC$1.00 MF$0.50

California Univ., Los Angeles.
ALLOCATION OF RESOURCES AMONG FUNCTIONALLY INTERDEPENDENT DEMANDS UNDER PREDOMINANTLY INTANGIBLE CRITERIA,
by A. Reisman, A. B. Rosenstein, and E. S. Buffa.
Feb 65, 24p Working paper no. WP-58
Contract Nonr23373, Proj. NR047 003
Unclassified report

Supported in part by the Western Management Science Inst. under a grant from the Ford Foundation.

Descriptors: (*Economics, Mathematical models), (*Management engineering, Decision making), Budgets, Game theory, Bargaining, Money.

Concluding remarks: This article recognizes that uncertainty and lack of objectivity exist as conditions under which many decisions relating to the allocation of resources are made. It does not presume to have developed a scientific theory which would eliminate such uncertainty and subjectivity. It does, however, provide a formalism which allows all projects and/or functions to compete for their share of resource allocation on a fair and equivalent, but not equal, basis. Thus, if any cheating, so to speak, is to be done all projects have an equal opportunity to cheat. This formalism can also be used by management in mechanizing such decision operations if these decisions are to be made more than once. (Author)

AD-613 671 Div. 32, 15
CFSTI Prices: HC$2.00 MF$0.50

California Univ., Los Angeles.
THE ECONOMICS OF UNCERTAINTY, VII,
by Karl Borch. Mar 65, 36p
Working paper no. WP-70
Contract Nonr23375, Proj. 047 041
Unclassified report

This paper is based on notes prepared for a series of lectures given at the California Univ., Los Angeles. Graduate School of Business, during 1964-1965
Supported by the Western Management Science Institute under a grant from the Ford Foundation.
See also AD-613 672.

Descriptors: (*Economics, Probability), (*Commerce, Game theory), (*Game theory, Commerce), Decision making, Optimization, Costs, Mathematical models.

The paper gives a brief outline of the classical proof that a competitive equilibrium is Pareto optimal. It is then shown that this result does not hold when uncertainty is brought into the model. (Author)

AD-613 672 Div. 32, 15
CFSTI Prices: HC$1.00 MF$0.50

California Univ., Los Angeles.
THE ECONOMICS OF UNCERTAINTY, V,
by Karl Borch. Mar 65, 24p Working paper no. WP-72
Contract Nonr23375, Proj. 047 041
Unclassified report

This paper is based on notes prepared for a series of lectures given at the California Univ., Los Angeles. Graduate School of Business, during 1964-1965.
Supported by the Western Management Science Institute under a grant from the Ford Foundation.
See also AD-612 731.

Descriptors: (*Economics, Probability), (*Game theory, Commerce), (*Commerce, Game theory), Decision making, Optimization, Money, Distribution, Statistical distributions, Quadratic programming, Factor analysis.

The paper contains a number of familiar results about optimal allocation of resources, and applies these to the problem of 'Portfolio Selection' originally formulated by Markowitz (Journal of Finance, 1952, p. 77-91; 'Portfolio selection - efficient diversification of investments,' John Wiley and sons, 1959). The paper also gives a brief survey of recent work on the experimental testing of the model. (Author)

AD-613 872 Div. 32, 15

California Univ., Los Angeles. Graduate School of Business Administration.

A PROBLEM IN MAKING RESOURCES LAST,
by J. MacQueen. Jan 64, 10p Unclassified report
Contract Nonr23375
Pub. in Management Science (U.S.) v11 n2 p341-7 Nov 1964
Copies not available to DDC or Clearinghouse customers.

Descriptors: (*Decision theory, Economics), (*Economics, Decision theory), Dynamic programming, Decision making, Probability, Game theory, Optimization, Management engineering, Functions.

An individual uses up a certain resource at a constant rate, but from time to time has a chance to gamble some of the resource in order to gain more. The expectation of each gamble is zero, i.e., the gambles are fair. This means that eventually the resource will run out. However, the form of the risk can be varied arbitrarily. The question is what form of risk to choose, when the object is maximize the expectation of the utility, u(T), of having the resources run out at time T. This problem is solved for a more or less arbitrary function u(T). Various possible interpretations of such a function u(T) are discussed briefly. The model is mainly intended to provide a basis for empirical studies of individual decision making, where its complete mathematical tractibility is convenient. (Author)

33. Transportation

AD-613 170 Div. 33, 13

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
TESTS WITH A C-130E AIRCRAFT ON UNSURFACED SOILS.
Final rept.,
by Loren M. Womack. Feb 65, 53p
Miscellaneous paper no. MP-4-712 Unclassified report

Available from U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi for $0.75.

Descriptors: (*Soil mechanics, Runways), (*Runways, Soil mechanics), (*Civil engineering, Runways), Soils, Trafficability, Take-off, Taxiing, Landings, Transport planes, Experimental data, Graphics.

The Waterways Experiment Station participated in an off-runway flight test program of the C-130E aircraft to the extent of assisting in the selection of test sites, obtaining soil data for evaluation of soil strength at each site, determining effects of C-130E operations on soil strength, and obtaining runway roughness data and analyzing them by the power-spectral method. Three test sites, representing low, medium, and high soil strengths, were each tested in 27 C-130E operations (takeoff, landing, and taxiing). Test results showed that the soil strengths at the high- (CBR 10+) and medium-strength (CBR 4 to 8) test sites were greater than required for the aircraft operations imposed. The loose, dry sand of the low-strength test site posed no serious problems to C-130E maneuverability. From the analysis of the roughness data it was found that although power-spectral density bears a relation to runway profile and can be used to define runway roughness, it does not provide an indication of the juxtaposition of bumps causing maximum response. It is recommended that profile data from other unsurfaced runways be collected for power-spectral analysis, and that tests be conducted to establish operational limitations on landing-gear structure with respect to rut depths. The basic concepts of the power-spectral technique for analyzing runway roughness are summarized in Appendix A. (Author)

AD-613 342 Div. 33, 13, 14
CFSTI Prices: HC$4.00 MF$0.75

Ling-Temco-Vought, Inc., Dallas, Tex.
RAPID SITE PREPARATION FOR TURBOJET VTOL AIRCRAFT.
Rept. for 1 Oct 63-31 Aug 64,
by J. E. Butler and G. F. Thomas. Oct 64, 108p
Contract AF33 615 1092, Proj. 8174, Task 817401
APL TDR-64-125
Unclassified report

Descriptors: (*Landing mats, Vertical take-off planes), (*Composite materials, Landing mats), Polyester plastics, Glass textiles, Heat-resistant materials, Additives, Reinforcing materials, Performance (Engineering), Exhaust gases, Turbojet engines, Degradation, Construction, Tests, Erosion, Soil mechanics.

A sprayable, rapid-curing, light-weight, low-cost material system for use as a remote landing and take-off site for turbojet VTOL aircraft was developed. The material system was composed of a chlorinated polyester resin system modified with temperature resistant additives and fiber glass reinforcement. The capabilities of the material system were demonstrated by testing in the direct exhaust of an afterburning J85-GE-5 turbojet engine in the Research and Technology Division jet test facility and by an operational field site used for repeated take-off and landings of an X-14A jet VTOL aircraft. The material system withstood temperatures up to 3000F for short time periods. It is believed that the basic VTOL landing site area exposed to the severe temperatures and velocities of a jet engine exhaust can be fabricated using a maximum of 2.5 lbs./sq ft. (Author)

AD-613 367 Div. 33
CFSTI Prices: HC$6.00 MF$1.50

Systems Research and Development Service, Federal Aviation Agency, Washington, D. C.
THE NATIONAL AIRSPACE SYSTEM 1965: MAJOR FACILITIES; FUNCTIONS; MAINTENANCE COSTS.
Interim rept.
Mar 65, 249p Rept. no. RD-65-25
Proj. 142 421 01A
Unclassified report

Descriptors: (*Terminal flight facilities, United States), Ultrahigh frequency, Very high frequency, Low frequency, Microwave frequency, Instrument landings, Approach lights, Beacons, Landing fields, Air traffic control systems, Towers, Radar stations, Housing, Costs, Maintenance.

Contents (largely systems and facilities):
100 Air navigation facilities UHF/VHF
150 Air navigation facilities L/MF
200 Instrument land systems
300 Approach light systems
400/420 Light beacons and fields
500 Air route traffic control centers and associated facilities
550 Long-range surveillance radar facilities
600 Air traffic control tower facilities
650 Terminal area radar facilities
670 Military approach control facilities
700 Flight service stations and associated facilities
800 International flight service stations and associated facilities
900 Secondary facilities - housing, utilities and miscellaneous
Equipments used for facility class determination
Computation of maintenance costs.